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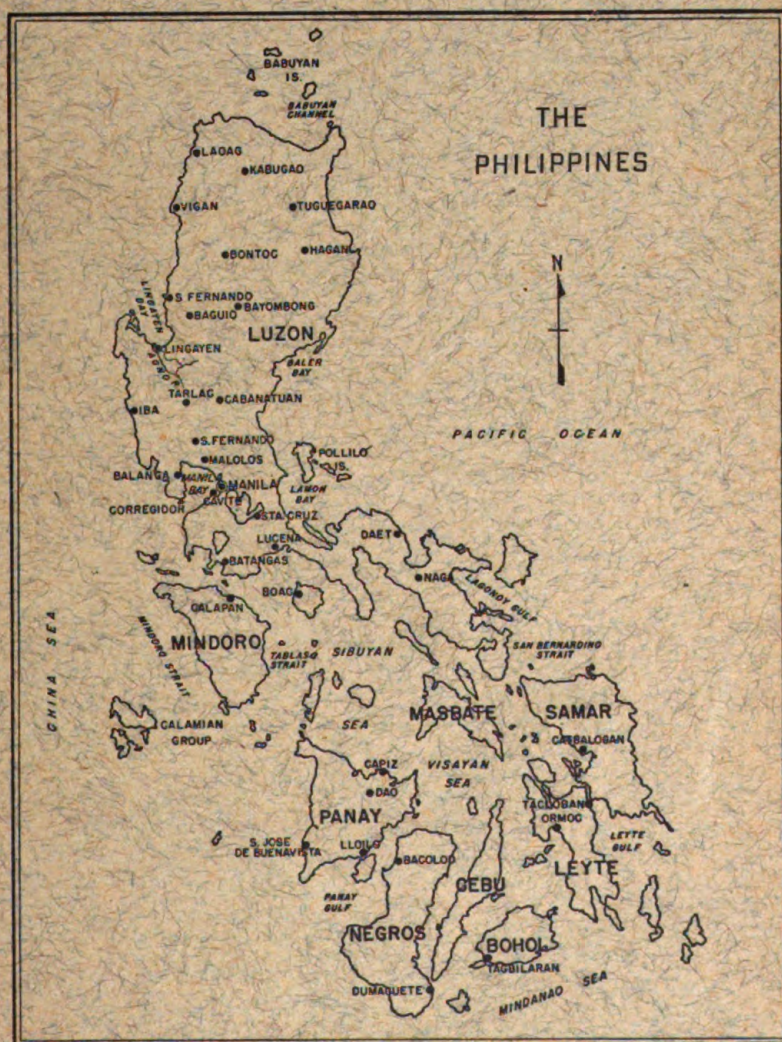
MARCH 1945

THE BULLETIN

OF THE

U. S. Army Medical Department

A periodical containing original articles, reviews, news, and abstracts of interest to the Medical Department of the Army



ISSUED UNDER THE AUSPICES OF
THE OFFICE OF THE SURGEON GENERAL

PUBLISHED MONTHLY AT THE MEDICAL FIELD SERVICE SCHOOL
CARLISLE BARRACKS, PENNSYLVANIA

By direction of the Secretary of War, the material contained herein is published as administrative information for the proper transaction of the public business and with the approval of the Director of the Budget.

NORMAN T. KIRK,
Major General, U. S. Army,
The Surgeon General.

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WAR DEPARTMENT
OFFICE OF THE SURGEON GENERAL,
WASHINGTON 25, D. C.

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Foreword

With the October 1943 issue, The Bulletin became a monthly periodical, instead of a quarterly, dedicated to keeping the personnel of the Medical Department informed on developments in war medicine. The new publication, known as The Bulletin of the U. S. Army Medical Department, absorbed the former quarterly dental and veterinary bulletins and will have material devoted to those fields in each issue.

The Bulletin is intended to be educational rather than directive in nature. It will contain the best information obtainable concerning military medical experience, observations, and procedure that may help to improve further the quality of professional services. The Bulletin will be a medium whereby experience gained in one theater of combat may be shared with those serving in other combat areas and with those in this country who are preparing for overseas duty. News items concerning military and scientific developments as well as original articles will be emphasized. The Bulletin, however, should not serve as a basis for the forwarding of requisitions for equipment or supplies referred to therein.

Obviously, some of the most interesting field experiences cannot be divulged in a periodical of this kind when our country is at war. The Bulletin will, however, publish that which can be safely told, drawing not only on current literature, but on many authoritative reports which reach The Surgeon General's Office from the field. Officers are invited to submit for publication reports of their field experiences that can profitably be shared with other officers.

The Medical Department has been commended for its work in caring for the sick and wounded in theaters of operations in war. The Bulletin will endeavor to stimulate such progress and to advance further the high standard of medical service in the Army of the United States.

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Contributions to The Bulletin should be typewritten, double spaced, with wide margins, and in duplicate including the original and one carbon copy. Great accuracy and completeness should be used in all references to literature, including the name of the author, title of article, name of periodical, with volume, page, and number—day of month if weekly—and year. Materials supplied for illustrations, if not original, should be accompanied by reference to the source and a statement as to whether or not reproduction has been authorized. Adequate legends should accompany each illustration in order to point out clearly to the reader the condition or lesion or other objectives, which in some instances should be indicated by a small arrow or other device. Each illustration and table should bear the author's name on the back; photographs should be clear and distinct; drawings should be made in black ink on white paper. Original articles will be accepted for publication on condition that they are contributed solely to The Bulletin and that editorial privilege is granted in preparing the material submitted for publication. Reprints may be ordered for official use. Arrangements for reprints for personal use may be made direct with the Book Shop, Medical Field Service School, Carlisle Barracks, Pennsylvania. The type will be held for two months following publication.

News and Comment

GAMMA GLOBULIN AND THE PREVENTION OF INFECTIOUS HEPATITIS

The cause of infectious hepatitis is not known, and, to date, no effective means of prevention, control, or treatment have been found. Serious outbreaks have occurred in several of the Allied armies and in those of Germany and Italy. Infectious hepatitis has been a serious problem also in civilian populations throughout the world.

Results obtained in an epidemic in a summer camp for boys and girls indicate that gamma globulin, a component of blood plasma effective in preventing measles, is capable of preventing or attenuating infectious hepatitis when administered to exposed persons during the incubation period of the disease. The epidemic began on 1 August 1944 and by 14 August, when the investigators were notified of its existence, about 80 persons in the camp had developed hepatitis. The occurrence of new cases during the next two days suggested that the entire camp population had been or would be exposed and that many other cases could be expected.

Twenty-nine of 159 well boys, living under the same environmental conditions, were injected intramuscularly with gamma globulin, leaving 130 as controls. Sixteen of 132 well females between the ages of 6 and 30 were injected with globulin, leaving 116 as controls. Eight other males between 16 and 40 years of age from miscellaneous camp groups also were injected. As expected, additional cases of hepatitis developed during five weeks following the globulin injections. Of the 29 boys injected, 4, or 13.3 percent, developed hepatitis but none developed jaundice. Of the 130 controls in this group, 90, or 69 percent, developed hepatitis, while 60, or 46 percent, also had jaundice. Of the 16 females injected with globulin, 3, or 18.7 percent, developed hepatitis and the same number also had jaundice. Of the 116 controls, 82, or 70.6 percent, had hepatitis, with 52, or 45 percent, developing jaundice. In the total of 53 persons receiving globulin, not one developed visible jaundice of the skin.

Abstract of an article by Joseph Stokes, Jr., M.D., Philadelphia, and Captain John R. Neefe, M.C., A.U.S., published in the *Journal of the American Medical Association*, 20 January 1945.

From the School of Medicine and Hospital of the University of Pennsylvania and the Children's Hospital, Philadelphia. This investigation was aided in part by the Commission on Measles and Mumps, Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, Preventive Medicine Service, Surgeon General's Office.

The gamma globulin used was prepared by the Harvard Plasma Fractionation Laboratory. One of the lots used was an experimental lot prepared under conditions slightly different from those employed in the preparation of the standard fraction being distributed for measles prophylaxis.

The onset of hepatitis in the 11 persons who received gamma globulin occurred during the first ten days after the globulin had been injected. No additional cases occurred among the injected group after this time. Cases continued to appear among the controls for thirty-two days after the date of the globulin injections. This would suggest that gamma globulin given late in the incubation period resulted in attenuation, rather than prevention, of the disease. However, the data indicate that infectious hepatitis was entirely prevented in some individuals, probably those who received the globulin early in the incubation period.

The results obtained in this epidemic are sufficiently encouraging to warrant further trials of gamma globulin in the control of future epidemics of infectious hepatitis.

MAXILLOFACIAL WOUNDS IN FORWARD INSTALLATIONS

Primary closure. The teaching that war wounds of the face differ from those of other parts of the body in that they can be closed primarily, under certain conditions, has been sound. In this theater not one case of proved gas gangrene of a facial wound has been seen. It has also been emphasized in teaching that débridement of facial wounds should be conservative and that no bone, skin, or buccal mucosa should be removed if it has a chance of survival. The trouble encountered in closure of these wounds has been due to too enthusiastic application of both of these principles; i.e., facial wounds *can* be closed, and débridement should be *conservative*. Some wounds have been closed that should preferably have been left open, and others have been closed after inadequate débridement. It has been demonstrated quite definitely that if a successful primary closure is to be accomplished, débridement must be meticulously complete. The only complication that has been encountered in closed facial wounds has been that of localized sepsis. Spreading infections of streptococcal or staphylococcal origin have been exceedingly rare. In cases that have become septic, the wounds have opened and secondary closure has been delayed. Good results have been obtained when the fundamental surgical principles of adequate cleansing and preparation of the wound, complete hemostasis, provision of drainage when indicated, and fixation and splinting, have been applied. Cases are seen in which great care has been exercised by some inexperienced surgeons in obtaining a very fine hairline closure of a wound that has either been inadequately débrided or not provided with necessary drainage. It was not sufficiently realized by some of the younger surgeons that a better result would be obtained by preparing a wound so that healing in its entirety would be assured, rather than in doing a fine job of skin suturing aimed at obtaining simply a nice cosmetic result. It should be the general rule in forward hospitals

Extract from a recent report from one theater of operations.

to spend more time on cleansing and preparing a wound for closure, and less time on the closure itself. Skin sutures without tension that do not necessarily result in a hairline scar but which do not leave wide suture marks are to be preferred over the time-consuming plastic closures that some surgeons have tried to accomplish. Failure to provide adequate surgical drainage has complicated some cases otherwise well handled. Wounds of the superior maxilla involving the paranasal sinuses are found inadequately drained rather frequently. Drainage is particularly necessary if the penetrating missile has been a small one and the resulting wound itself is not large enough to provide adequate drainage. Wounds of the lower jaw with extensive comminution of the bone and little soft tissue loss are very prone to flare up with infection if prophylactic drainage is not provided. The principle of leaving open the extensive wounds with loss of tissue has been satisfactorily practised. Suture of skin to buccal mucosa in suitable cases has gained great favor and is unquestionably a good procedure.

Bony fixation. The application of simple methods of replacing and splinting the jaws and fractured bones in the forward areas has been found, on the whole, to be quite satisfactory. This has been done by supporting bandages, or by simple intermaxillary elastic traction, and often, when indicated, by superior elastic traction to a gauze bandage or web head cap. Plaster head caps have been used, but they are gradually falling into disfavor, especially with the surgeons who receive the cases into general hospitals. In the usual case, their period of usefulness lasts only a week or ten days and this period of time can, in most instances, be satisfactorily covered by a simpler type of head appliance. Several surgeons have voiced a desire for equipment for applying external pin skeletal fixation in forward hospitals. Very few cases have been seen in which such appliances might have been used to advantage at this level. It has been the aim to encourage rapid evacuation of complicated cases to a general hospital where personnel and facilities are available to carry through completely the procedures that may be necessary. The excitement that has existed about what to do with the edentulous posterior fragments has been proved by experience to be unjustified. Most of the posterior fragment problems can be handled by much simpler mechanical measures than the external pin fixation method. As a matter of fact, the great majority of cases have only slight superior displacement of the posterior fragment and no disability will result if the fragments are in such a position that union can take place. It is felt that if equipment for external pin skeletal fixation had been supplied to the forward medical installations it would have been quickly used up on cases that might just as easily, or better, have been handled by simpler methods. The over-all quality of work that has been done by the surgeon and dental officers in forward hospitals

has been high, considering the great number of these officers through whose hands the patients pass. A good many of the cases arriving in general hospitals have satisfactory reduction and fixation that do not have to be altered.

OBSERVATIONS ON HAND INJURIES

Dr. Sterling Bunnell, a civilian consultant to the Secretary of War, visited a number of general hospitals in United States during December 1944. His observations made in these installations should be of interest to all medical officers. Dr. Bunnell stated in a letter to The Surgeon General that he examined about seventy hand cases in each hospital. There were many more of which too many showed the following:

1. Malunion of phalanges and especially metacarpals showing zigzag positions of fragments and overlapping due to lack of early traction. There were also rotation deformities and shortening.

2. In most cases, the proximal finger joints were stiff and straight. When fixed in this position they cannot be flexed due to shortening of their collateral ligaments. This is usually preventable by early traction in flexion and early exercise in flexion.

3. Often all the joints of the hand were stiffened from splinting too much of the hand, not keeping the digits moving and splinting for too long a time. Many were from banjo splinting with fingers and palm straight instead of curved.

4. Almost all wrists in plaster of paris were in the straight position instead of dorsiflexed.

5. Hands were usually not in the functioning position—namely, with wrist dorsiflexed, proximal finger joints flexed, and the thumb opposed. Some of these were from muscle imbalance due to nerve injury, but were unsplinted.

6. Many hands were too greatly indurated and with large scars and flexion contractures from not having been closed over early by skin grafts.

Splints with which the joints may be drawn into position for function such as the wrist into dorsiflexion, the proximal finger joints into flexion, and the thumb into opposition, etc., should be made in local brace shops. With plaster of paris, castex, or metal, a splint can be made to correct the deformity of median and ulnar nerve palsy. For radial nerve palsy the light Oppenheimer wire spring splint seems desirable as it is cheap and easy to make, fits through a coat sleeve, checks only the joints desired, and allows free movement of the muscles, tendons, and joints in forearm and hand. For small miscellaneous splints for digits, strips of inexpensive vinylite sheets held over a Bunsen burner may be quickly fashioned as desired.

Joints and stiff hands loosen up better under actual use than by passive physiotherapy. Though heat is beneficial for the short time a day that it is given, rough manipulation of finger joints is harmful, and lights and electricity of very doubtful value. Occupational therapy, on the other hand, actually gives good results, and I believe should be encouraged. Various wooden blocks with holes which place fingers in desired positions are used for sandpapering. These are excellent and also the various occupational procedures placing each man in the occupation which will be beneficial for his hand. Valley Forge General Hospital has an especially good department of this type, as have some of the other hospitals.

INCREASE IN RETURNING CASUALTIES

The Surgeon General stated on 5 January that more than 30,000 sick and wounded battle and nonbattle casualties returned to the United States in December. General Kirk said that this is a 300 percent increase over the number of battle and nonbattle casualties returned in July. The policy of the Medical Department, whenever possible to satisfy the desire of a soldier, is to send the soldier to a hospital near his home; however, in view of the increased evacuation of patients, it is impossible to send all patients to hospitals near their homes.

Three principal factors guide the Medical Department in the selection of the hospital to which a soldier will be sent: (1) Where can the patient get the best treatment for his particular case. (2) What hospitals offering such specialized services have the facilities to care for additional cases. (3) What suitable and available hospital is located nearest to the soldier's home.

The benefits of sending a man to a hospital a relatively short distance from his home must be weighed against the nature of his wound or illness, the need for specialized care, and the availability of beds in hospitals near his home which are equipped to handle his case. The shortage of specialists in the United States permit only a limited number of hospitals to be designated as centers for each type of specialty.

MORE HOSPITAL SHIPS

Five more troop ships will be converted into U. S. Army hospital ships to ensure speedier return of the wounded. These ambulance-type hospital ships will bring to twenty-nine the number of such vessels operated by the Transportation Corps, Army Service Forces. The new ships will have a total capacity of 5,355 patients. The *Saturnia*, a former Italian luxury liner, will have a capacity of 1,300 litter and 388 ambulatory patients. Other vessels slated for conversion are the former French liners *Colombie* and *Athos II*, and the former U. S. liners *Republic* and *President Tyler*. The *President Tyler*, originally owned by the American President Lines, will have a capacity of 650 litter and 158 ambulatory patients; the *Republic*, former Hamburg-American liner, was seized by the United States in 1917 and used as a troop ship in the World War, changed from the *Servian* to the *President Grant*, after which she was turned over to the U. S. Shipping Board and, in 1931, reconditioned as an Army transport; her capacity will be 900 litter and 300 ambulatory patients. The *Athos II*, built at Bremen, Germany, for the French Messageries Maritimes lines, will carry 615 litter and 264 ambulatory patients. The *Colombie*, built at Dunkerque, France, has a capacity of 608 litter and 172 ambulatory patients. Two other Army steamers are under conversion as hospital ships, the *Ernestine Koranda*, named for an Army nurse, and the *Louis A. Milne*, named for a former New York port surgeon.

RECRUITING WACS FOR SERVICE IN GENERAL HOSPITALS

With a critical shortage of nurses and technically trained Medical Department personnel, General of the Army George C. Marshall, Chief of Staff, announced on 10 January the start of a drive to enlist WACs for the Women's Army Corps medical units for service in general hospitals in this country. General Marshall called on the governors of all states and the commissioners of the District of Columbia to exercise their leadership in aiding this vitally urgent program.

The plan is to assign 100 women to each of the 1,000-bed hospitals and an additional 100 for each additional 1,000 beds in the larger hospitals. While made up of medical and surgical technicians primarily, these companies will include some women of clerical skills and technicians in other fields, such as x-ray, laboratory, and dental.



Learning to be a dental technician at the Medical Department Enlisted Technicians' School, Camp Atterbury, Indiana.



Surgical student in training at Enlisted Technicians' School, Camp Atterbury, Indiana. Her course will include laboratory work and actual hospital experience.

Women qualified for training as medical and surgical technicians and clerical workers, and other skilled women, are urgently needed to fill these hospital units to aid in the care and rehabilitation of returned soldiers and release able-bodied men from technical and administrative duties. More than 8,000 additional WACs are required for this purpose.

In an accelerated training program prepared by The Surgeon General's Office, qualified women enlisted as medical and surgical technicians will be as-

signed to a hospital unit as students after six weeks of basic military training and six weeks at an enlisted technician's school. They will receive one month of applicatory training after assignment to the hospital. On satisfactory completion of this training, they will qualify as technicians with appropriate Army ratings and will continue on duty at the place of their training.

The Medical Department load is higher now than it has been in the Army's history. For this reason, the Army has set up one all-WAC enlisted technicians' school at Wakeman General Hospital, Camp Atterbury, Indiana, and has made coeducational three other technicians' schools which had formerly been used to train men only. These are Beaumont General Hospital, El Paso, Texas; Fitzsimons General, Denver, Colorado; and Brooke General, Fort Sam Houston, Texas. The all-WAC school at Camp Atterbury will also continue with its training of dental, laboratory, and x-ray technicians.

Another branch of the problem of training WACs is being carried out at the Northington and Foster General Hospitals where in January 1945 sixty enlisted women reported at each hospital for training as medical and surgical technicians. In the pilot courses conducted there, these trainees are given the approved enlisted technicians' school program with one-half day of didactic instruction and the other half day spent in applicatory training on the wards.



A wounded "GI" helps his buddy back to a hospital area during the Cisterna offensive. 23 May 1944. Signal Corps photograph.

MEDAL OF HONOR

President Roosevelt, on 10 January, at the White House, presented the Medal of Honor to Private First Class Lloyd C. Hawks, medical detachment, Infantry, United States Army, for gallantry at risk of life above and beyond the call of duty.

On 30 January 1944, near Carano, Italy, Pfc. Hawks braved an enemy counterattack to rescue two wounded men. Two riflemen, attempting the rescue, had been forced by machine-gun fire to return. An aid man whom the enemy could plainly identify had been wounded in a similar attempt. Pfc. Hawks crawled fifty yards through a hail of machine-gun bullets and mortar fragments to a ditch, gave first aid to his fellow aid man, and continued toward the two wounded men fifty yards away. A bullet knocked the helmet from his head and thirteen bullets passed through his helmet as it lay within six inches of him. Pfc. Hawks crawled to the casualties, gave first aid to the more seriously wounded man, and dragged him to cover. Despite continuous automatic fire and shells which exploded within 25 yards, he returned to the second man and administered first aid. In obtaining bandages from his kit, his right hip and forearm were shattered by machine-gun fire. Pfc. Hawks, despite these wounds, completed bandaging the remaining casualty and dragged him to a depression. He then crawled 75 yards, reaching the ditch in which his fellow aid man was lying.



The President presents the Medal of Honor to Private First Class Lloyd C. Hawks, whose niece and brothers are also present. U. S. Army photograph.

ABDOMINAL WALL WOUNDS A SOURCE OF INTRA-ABDOMINAL HEMORRHAGE

In the absence of bleeding from visceral wounds or injured intra-abdominal vessels, persistent intraperitoneal hemorrhage in perforating wounds of the abdomen must originate from the injured abdominal wall. The possibility of a parietal vessel bleeding through the peritoneal defect into the abdominal cavity should always be kept in mind in cases with perforating abdominal wounds in which the intra-abdominal collection of blood continues despite control of all detectable intra-abdominal sources of bleeding. Because blood from an abdominal wall wound may make its initial appearance to the operator in a site remote to the wound due to gravitation along the paracolic gutters, the deception may be even more complete. This is particularly likely to occur when a patient is in the Trendelenburg position, for in such an instance the bleeding arising from a lower abdominal wall wound may seemingly arise from over the dome of the liver or in the region of the spleen. The careful inspection of wounds of entrance and exit from within the abdomen in such cases may prevent an unnecessary loss of blood and avert the needless prolonging of an operative procedure by a search for an intra-abdominal bleeding point which does not exist.

From the Surgical Consultants Division, Office of The Surgeon General.



Evacuation of wounded, most of whom participated in campaigns at Guadalcanal, Tulagi, Munda, Rendova, and Vella Lavella. The patients are being taken to the ship that brought them to the United States. 1943.

ORTHOPEDIC MECHANICS

The casualties evacuated to hospitals in the zone of the interior for definitive treatment contain a mounting proportion of amputees and orthopedic patients who will require prostheses or other form of orthopedic appliances. In order that suitably trained enlisted personnel may be available for fabricating such devices, the applicatory training program for orthopedic mechanics in the workshops of A.S.F. regional and named general hospitals has been enlarged. Not only has the capacity of the courses at the seventeen installations conducting this type of training prior to 1 January 1945 been expanded but the program has also been extended to thirty additional installations. During the twelve-week course, enlisted trainees selected for mechanical aptitude and experience in metal work are given an intensive course in all phases of brace making. Trainees with exceptional ability are given advanced training in limb fitting and construction. Quotas for such courses are available through the usual channels.

AMEBIASIS IN THE ARMY OVERSEAS*

Amebiasis is being reported with increasing frequency in U. S. Army troops overseas. Although the disease is endemic in every area where troops are stationed, poor environmental sanitation in some places makes it relatively more difficult to prevent transmission of *Endamoeba histolytica*. About one-half the cases reported have occurred in the China-Burma-India Theater, where rates for amebiasis are not higher than rates for malaria in some of the tropical theaters. There is nothing to indicate gross contamination of the water supply of a large group which would result in an epidemic. The erratic but continued increase in amebiasis is apparently due to prolonged contact with poor environmental sanitation under field conditions.

Uncleanly food handlers probably play a considerable part in the transmission of amebiasis to troops. In commands where the greatest incidence has been found, it has been a common practice to use natives as food handlers. Also many small units have found it necessary to use surface water supply and often have permitted native help to handle the water, giving opportunity for recontamination even if it had once been rendered safe by boiling. In these same areas the control of flies has been a difficult problem. In both the China-Burma-India and the Middle East Theaters there was a noticeable increase in rates for the months of May to September in 1943 and 1944. The practice of obtaining food and drink in establishments not under Army control also has probably played an important part in transmission of the disease.

*From the Tropical Disease Control Division, Preventive Medicine Service, Surgeon General's Office.

LIMB FITTERS WANTED

Army amputation centers in this country are in need of expert limb fitters. Civilians with the necessary technical background in manufacturing, adapting, or repairing orthopedic appliances are urged to qualify for the new Civil Service positions of Orthopedic Technical Advisers. A technical adviser grade P-4 receives \$4,428 a year, serves as consultant to the orthopedic surgeon on the design and construction of artificial limbs, and counsels amputees on their use. A technical adviser grade P-3 receives \$3,828 a year and acts as assistant, performing specific research, designing and fitting limbs, and training enlisted shop personnel. Inquiries should be directed to The Surgeon General's Office or to the Civil Service Commission, Washington 25, D. C. Orthopedic shops are located at Bushnell General Hospital, Brigham City, Utah; Thomas M. England General Hospital, Atlantic City, New Jersey; Percy Jones General Hospital, Battle Creek, Michigan; Lawson General Hospital, Atlanta, Georgia; McCloskey General Hospital, Temple, Texas; and Walter Reed General Hospital, Washington, D. C.

FIELD DISTILLING APPARATUS

The water still (Item No. 9954600), recently added to the ASF Medical Supply Catalog by Change 1 on MED 3, is a simple distilling apparatus for mounting on the side of the portable disinfecter (Model MDS-AL) (Item No. 7791000), to which it is connected to the water and steam piping. The still uses the excess heat capacity of the disinfecter for the production of about 7½ gallons of distilled water per hour. Directions for installation with diagrams for piping are included with each still along with necessary piping and parts, so that attachment of the still to the disinfecter may be done in the field. The still may be operated concurrently with the shower and disinfecting chamber of the latter in full normal operation. *However, the distilled water produced is not pyrogen-free, and, therefore, not suitable for intravenous preparations.*

The still, a new item, is not included in the catalog as a separate item in any equipment lists or tables of equipment, as it is designed primarily to be attached to the portable disinfecter. In Change 2 to ASF Catalog MED 3, the description of Item No. 7791000 has been modified to state that the disinfecter is "complete with 9954600." The new still will be furnished to each unit now having the portable disinfecter, specifications for which have been revised to provide that future purchases of the disinfecter will include the still as a component apparatus. As the still becomes available, supply agencies will assume the responsibility of distributing this item to using units. Meanwhile, any disinfecters on hand for which stills have not been received should be continued under their proper item number pending

receipt of stills for attachment thereto. Disinfectors complete with stills should not be requisitioned to replace them.

Since the portable disinfector itself is actually field equipment, this item is being assigned a new number in Class 9, which change will be published shortly. However, this shift in catalog position for the disinfector in no way alters the status or handling of the item with relation to the facts outlined.

ARMY DEVELOPS SUPERIOR ARTIFICIAL EYES

Artificial eyes are now being made of a plastic that can be tinted to duplicate every appearance of the natural eye, and in other ways they are superior to custom-made glass eyes. The artificial eye laboratory at Valley Forge General Hospital was the training center in which officers and enlisted men learned to create the new plastic eyes. The fitting of the artificial eye into the socket is done so well that considerable movement is possible, thus further avoiding an artificial appearance.

Major General Norman T. Kirk, The Surgeon General, credits three dental officers for the new development: Captain Stanley F. Erpf, Major Milton S. Wirtz, and Major Victor H. Dietz, who were working separately in England, Camp Crowder, Missouri, and Atlantic City, New Jersey. The Office of The Surgeon General had these men brought to Valley Forge General Hospital in order to pool their knowledge of plastics, science, and medicine, and esthetic aptitude, to found the artificial eye laboratory. Within six months they had perfected their techniques so that other men could be trained in thirty days to turn out the finished product. The three officers have now been assigned to other areas in the country, separately, so that each may continue experimentation and train still more technicians in this new art.

The construction of the new plastic eye is a step-by-step procedure which, when described in detail, seems complex, but each stage in the process is relatively simple. An additional advantage of the new plastic eyes is that they are practically indestructible. This is in sharp contrast to glass eyes which break easily if they are dropped. Plastic eyes can be bounced on the floor without injury. A custom-made glass eye may cost up to \$300, depending on the reputation of the maker. The new plastic eyes can be made for less than \$5 apiece and rival the custom-made jobs in quality.

Soldiers to be trained as technicians to make artificial eyes are eagerly sought in the Army. So far, the men who have worked out best are those who were dental technicians in civilian life.

Psychiatric Nursing Schools.—As of 1 January 1945 psychiatric nursing schools were in operation in the First, Second, Fifth, Seventh, and Eighth Service Commands, and it is hoped to have schools operating in all service commands within the next few months.

COMPOSITION OF INSECTICIDES CONTAINING DDT

Information regarding the composition of the DDT insecticides listed in War Department Circular No. 151, dated 17 April 1944, is published in order that medical officers may advise the use of those items best suited for the control of any particular insect. This information is also contained in a TB MED now in preparation—The DDT Insecticides and Their Uses. Meanwhile, W.D. Circular No. 151 is being revised to readjust upward certain of the allowances and will be published as a new circular shortly.

1. Quartermaster Stock No. 51-I-173: INSECTICIDE, POWDER, LOUSE, 2-OUNCE CAN.—(Formula: 10 percent DDT in pyrophyllite; finished product; packaged in small, oblong-base, sifter-top cans, approximate size $2\frac{5}{32} \times 1\frac{1}{2} \times 2\frac{7}{8}$ inches; 48 cans to a carton.) This item is for use as an individual measure for the prevention or eradication of louse infestation by dusting on the inner surface of underwear, and should be issued to soldiers in the field as part of their equipment.

2. Quartermaster Stock No. 51-I-180: INSECTICIDE, POWDER, LOUSE (Bulk). (Formula: 10 percent DDT in pyrophyllite; finished product; packaged in 5-pound, moistureproof, round, metal containers; approximate size $6\frac{5}{8} \times 7\frac{1}{2}$ inches; 6 containers to a box.) This item is for use primarily in mass delousing with hand dusters or power dusters, and also for disinfestation of transports as in the past. The latter use should be supplanted by Insecticide, spray, DDT, residual effect. The louse powder is also suited for control of other insects such as bedbugs, roaches, and ants and may prove effective for treating the habitats of fleas and mites.

3. Quartermaster Stock No. 51-L-120: LARVICIDE, DDT, POWDER, DISSOLVING. (Formula: 100 percent DDT powder, commercial grade; stock preparation for making final product; packaged in 10-pound, oblong-base, moistureproof, metal containers; 4 containers to a box.) This concentrated DDT powder is issued for dissolving in the field with suitable oils to make 5 percent to 0.5 percent DDT sprays for fly larviciding purposes or in areas where mosquitoes breed. Being straight DDT it could also be used to make a satisfactory substitute for several other DDT preparations when the finished product is not available, as for example, Insecticide, spray, DDT, residual effect (5 percent DDT in kerosene) for the treatment of surfaces on which insects crawl or rest in the interior of habitations and elsewhere, when the finished product is not available.

4. Quartermaster Stock No. 51-L-122: LARVICIDE, DDT, POWDER, DUSTING. (Formula: 10 percent micronized DDT in talc; stock mixture; packaged in 5-pound, moistureproof, metal containers; 8 containers to a box.) This powder is a stock mixture for diluting with an inert diluent to form a 1 to 5 percent DDT dust (preferably 2 percent DDT), and designated for use where a dusting powder is desired on areas where mosquitoes breed. It could be used as a lousicide for mass delousing when Insecticide, powder, louse, is not in hand, is suitable for control of other insects such as bedbugs, roaches, and ants, and may prove effective for treating the habitats of fleas and mites.

5. Quartermaster Stock No. 51-I-305: INSECTICIDE, SPRAY, DDT, RESIDUAL EFFECT. (Formula: 5 percent DDT in refined kerosene; finished product; packaged in 5-gallon metal containers and some in 55-gallon steel drums.) At first, this spray is being issued for use primarily in *fly and mosquito control*—and secondarily for louse, bedbug, flea, roach,

and ant control. It is designed for spray or paintbrush application to surfaces upon which insects crawl or rest, and exerts its effect by the prolonged residual action of the DDT deposit. Extensive use of this spray should be made in areas where dysentery, diarrhea, and malaria rates are high. It should also be used aboard ships to disinfest troop and other compartments. The widest field of application of any of the DDT insecticides is predicted for this item. Many of the insects of military importance may be brought under effective control with its use.

6. Quartermaster Stock No. 51-I-169: INSECTICIDE, LIQUID, FINISHED SPRAY. (Formula: 1 percent DDT and $2\frac{1}{2}$ percent thanite in refined kerosene; finished product; packaged in 5-gallon metal containers.) The DDT formula has recently been adopted for this item and procurement initiated. The item is the finished product, and will be issued as in the past for use as a general utility insecticide against all types of insects. Dispersal is directly on the insects by means of the ordinary hand "flit gun" type of sprayer. The previous formula consisted of 5 percent thanite in kerosene. Stocks on hand in the field can easily be converted, if desired, by adding an equal amount of refined kerosene plus the necessary amount of DDT for a 1 percent DDT solution. Thus, stocks of this item can be doubled, but labels should be altered to indicate the DDT content.

7. Quartermaster Stock No. 51-I-310: INSECTICIDE, SPRAY, DELOUSING. (Formula: 6 percent DDT, 68 percent benzyl benzoate, 12 percent benzocaine, and 14 percent Tween-80; stock solution; packaged in 1-gallon and 5-gallon metal containers.) This is a new formula containing DDT for a previously listed item and its procurement is just commencing. Prior to use it must be diluted one part concentrate to five parts water (by volume) to form an emulsion-type spray. Mix only sufficient for the estimated need, and use within twenty-four hours. Item is designed for use where baths are included in the disinfestation procedure, and is for application to hairy parts of the body. It will kill both adults and eggs (nits) of body, head, and crab lice. It is also an effective scabicide.

8. Quartermaster Stock No. 51-I-159: INSECTICIDE, AEROSOL, 1-POUND DISPENSER. (Formula: 3 percent DDT, 2 percent pyrethrum (20 percent extract), 5 percent cyclohexanone, 5 percent hydrocarbon oil, and 85 percent Freon-12; finished product; packaged in small, 1-pound steel cylinders under pressure and equipped with release valve; two types—Westinghouse and Armstrong; 24 to a carton.) The above formula has been adopted to replace the present one which contains no DDT. DDT "aerosol bombs" are an olive-drab color, affording easy differentiation from the black-colored dispensers previously issued. Procurement is likely to continue limited, and consequently their use must be restricted to mosquitoes and biting flies (*Phlebotomus* flies, tsetse flies, midges, etc.). Issue is confined to troops overseas, ship hospitals, and aircraft.

9. Quartermaster Stock No. 51-I-59: INSECTICIDE, DDT, EMULSION CONCENTRATE (formerly called insecticide, DDT, louse-proofing, underwear). (Formula: 25 percent DDT, 10 percent triton X-100, and 65 percent xylene; stock solution; packaged in 5-gallon metal containers.) This preparation is issued primarily for impregnating underwear in the field to render it louse-proof for several months through 6 to 8 ordinary launderings. Before use it must be diluted one (1) part emulsion concentrate to eleven (11) parts fresh or sea water (by volume) to form approximately a 2 percent DDT emulsion. Solution should be slightly stronger than 2 percent DDT since recommended dosage of DDT is 2 percent of the dry weight of the underwear. In later procurement of this item triton X-100 may be replaced by another emulsifier.

DDT IN FLY CONTROL

Certain of the DDT insecticides now available are highly effective in fly control. Insecticide, sprya, DDT, residual effect, which contains 5 percent DDT in kerosene and is used by applying to surfaces on which flies crawl or rest, is recommended. Present indications are that this DDT residual spray, or a powder consisting of 10 percent DDT in a neutral vehicle, such as talc or pyrophyllite, is equally effective in fly larvae control by application to their breeding places.

The DDT insecticides suitable for use in fly control are: (1) Insecticide, spray, DDT, residual effect (5 percent DDT in kerosene), QM Stock No. 51-I-305. (2) Insecticide, powder, louse (10 percent DDT in pyrophyllite), QM Stock No. 51-I-180. (3) Larvicide, DDT, powder, dusting (10 percent DDT in talc), QM Stock No. 51-L-122. For the present, it is advised to use the DDT insecticides as follows in pit latrines:

Apply DDT residual spray at the rate of 200 mg. DDT per square foot (1 quart of 5 percent DDT residual spray for approximately 250 square feet) to the walls of the pit, inside and outside of latrine box, and to all the walls, window screens, and screen doors of the enclosure. One application usually is sufficient for several months or longer. Apply DDT residual spray at the rate of 2 ounces per latrine box hole (1 ounce per 2 square feet), or 10 percent DDT in powder form at the rate of 1 ounce per hole (1 ounce per 4 square feet) to the pit contents. Apply twice weekly at first until local experience reveals how often application need be repeated.

Residual spray may also have a place in the field for treating destroyed ration dumps and dead bodies to control fly breeding. As little as 0.025 percent DDT in oil has been found effective in killing maggots breeding in meat. The use of the residual spray for this purpose should be effective in killing both the adult flies which alight on the decaying material and the larvae which emerge from any eggs the adults have been able to deposit before dying. It has been reported, however, that the odor at times may be offensive, and work is under way to find a satisfactory deodorant to incorporate in a spray for this purpose.



Horses graze near Orleans, France, after drawing loads of Nazi prisoners to roundup section. Signal Corps photograph.

ABSENCE OF ELECTROCARDIOGRAPHIC CHANGES IN SCRUB TYPHUS FEVER*

Interstitial and perivascular infiltration of the heart muscle with inflammatory cells and varying degrees of change in the muscle fibers were observed in fatal cases of scrub typhus in our troops in the New Guinea Campaign. Weakness and tachycardia were not uncommon in soldiers convalescing from the severe infections. The impression was thus gained that residual heart damage might follow this disease.

To obtain electrocardiographic evidence of myocardial damage, tracings were made in 200 consecutive cases admitted to a station hospital in a Pacific theater. The patients were seen at varying intervals following the onset of the disease, 92 percent being examined within one to four weeks after the acute symptoms subsided; others were examined during the height of the disease and still others six to twelve months after their illnesses. The blood serum of 50 percent of the group still produced agglutination of *B. proteus* Kingsbury strain in dilution of 1:160 or higher. Adenopathy was still present in 89 percent of the cases, 48 percent still showed evidence of eschars, and all gave a history of sustained febrile illness of seven to twenty-four days' duration. Absence of conduction disturbances and abnormal T wave changes in the electrocardiograms was significant. A similar finding would not be expected after acute rheumatic fever or diphtheria which are known to affect the heart muscle. Typhoid fever and other acute infections produce inflammatory changes in the myocardium similar to those observed in scrub typhus without leaving demonstrable residual myocardial damage. The tachycardia which sometimes follows scrub typhus may well be vasomotor in origin as it is in other prolonged febrile illnesses.

In this study of 200 consecutive convalescent patients, no abnormal electrocardiographic pattern was found and the incidence of isolated deviations from the normal was no higher than those found in healthy individuals of the same age. This evidence further substantiates statements on the residual effects of scrub typhus made in *The Bulletin* in January 1945, page 21.

NOTE FOR LABORATORY OFFICERS

Copies of "Clinical Methods for the Coleman Junior Clinical Spectrophotometer" are now available for distribution (1 each) to installations having an electric photometer (Med. Dep. Item No. 4381500). Distribution is being made through supply depots or ports of embarkation. The methods included in the booklet have been coordinated with the methods to be included in the revision of TM 8-227.

*Abstract of paper by Major William L. Howell, M.C., submitted through The Surgeon General's Office to Journal of the American Medical Association.

POSTWAR EDUCATION OF DENTAL OFFICERS

The Director of the Vocational Rehabilitation and Education Service, Veterans' Administration, Mr. H. V. Stirling, has answered questions submitted by Major General Robert H. Mills, director, Dental Division, The Surgeon General's Office.

Question 1. A provision with reference to eligibility for one year's graduate, postgraduate, or refresher work by dental officers over or under twenty-five years of age, who have served ninety or more days in active military or naval service on or after 16 September 1940 and prior to the termination of war, is that the person must have been discharged or released from the service under conditions other than dishonorable. Many dental officers have accrued leave on the basis of thirty days a year, and it is possible for an officer to accrue up to, but not more than, one hundred and twenty days in four years' time in active service. This means that the dental officer may be placed on terminal leave, for example, on 1 January 1945 but will not actually be relieved from active duty until 30 April 1945. It is possible and highly desirable, if the officer wishes to do postgraduate work, during this interim of terminal leave to start his class work. Although this officer is not required to be on duty in a military installation, he will be paid his salary until the end of his terminal leave when he will revert to an inactive status. Will this dental officer be eligible for:

a. Tuition, instruments, laboratory fees, and books prior to the end of his terminal leave in a sum not to exceed \$500, provided this sum is paid directly by the Veterans' Administration to a school in which he is formally enrolled as a student.

b. The stipend through Veterans' facilities of \$50 per month if he is single, or \$75 if he is married.

Answer. The act of 22 June 1944, Title II, amending Veterans' Regulation numbered 1(a) by adding Part VIII, states:

"Any person who served in the active military or naval service on or after September 16, 1940, and prior to the termination of the present war, and who shall have been discharged or released therefrom under conditions other than dishonorable, and whose education or training was impeded, delayed, interrupted, or interfered with by reason of his entrance into the service, or who desires a refresher or retraining course, and who either shall have served ninety days or more, * * * or shall have been discharged or released from active service by reason of an actual service-incurred injury or disability, shall be eligible for and entitled to receive education or training under this part: * * *"

It therefore seems apparent that the Veterans' Administration is without authority to provide benefits under this act to any service person prior to the time of his release from active duty. It is understood that your question refers to officers who are still on active duty status but are being afforded accrued leave in the nature of terminal leave prior to their separation from active service.

a. Payment of tuition for courses attended during this period of leave prior to separation from active service, therefore, may not be authorized.

b. In a similar manner, the payment of subsistence allowance during the period of leave prior to separation from active service may not be authorized.

Question 2. If the answer to 1a and b above is "No," then:

a. Can the school anticipate payment for fees and books subsequent to his terminal leave, if such arrangements can be made with the institution?

b. Will the stipend of \$50 or \$75 start at the end of his terminal leave, even though the officer elects to start school at the beginning of his terminal leave?

c. Is it recommended that the officer wait for one or four months, until the end of his terminal leave, before the graduate, postgraduate, or refresher course is initiated? What are the over-all provisions in these situations?

Answer. a. The Veterans' Administration is authorized to pay to educational or training institutions, for persons enrolled in courses of education under this act, the customary cost of tuition and usual fees, but the Veterans' Administration could not assume the cost of tuition for courses pursued prior to the time service persons become eligible under the provisions of this legislation. Therefore, payment could not be made retroactively for tuition and charges for books and supplies for that part of a course of instruction pursued prior to the date of separation from active service.

b. Provision is made for payment to an eligible veteran and to an approved institution beginning as early as the date of the veteran's initial application so that payment of subsistence allowance may be made to the service person beginning the date following his separation from active service if application is filed on that date and if the service person was receiving a course of education or training at an approved institution on that date regardless of prior attendance in the course.

Question 3. The number of dental schools which can and will afford graduate, postgraduate, and refresher courses to dental officers relieved from the service is relatively few, with the result that opportunities for such education in dentistry will be limited.

There is now at least one state dental society that has had, for a number of years, well-organized refresher courses (sponsored by the society) with excellent instruction. The courses were developed by the society to supplement the dental school's postgraduate and refresher instructions. Although these courses are not sponsored by a recognized school of dentistry, the instruction received is of the highest quality. Other states, because of inadequate school facilities, might well develop a comparable program. The questions, therefore, arise:

a. Since these courses are not sponsored by a recognized dental school, but by the state dental society, can such a society with a well outlined course of instruction receive the tuition, etc., from the Veterans' Administration?

b. Can the students (former qualified servicemen) receive the stipend of \$50 or \$75 during the interim of the course?

c. Are there any special provisions that would permit the state dental society to participate in the giving of dental courses, whereby the Veterans' Administration would allot to the society the tuition which ordinarily would be designated to a recognized educational institution?

Answer. In response to your third question, a, b, and c, you are advised that there is no reason why a teaching institution such as that apparently contemplated should not be set up, and in the event of its approval by the appropriate state agency as required by law, may not thereafter receive payment for the instruction afforded veterans under Title II, Public 346, 78th Congress, provided the charges made are not in excess of the charges to students other than veterans and not in excess of the maximum allowable under the law. In regard to payments of tuition, it is important to observe that with reference to the provision of the act permitting payment up to the sum of \$500 for an ordinary school year, such payment is applicable to full-time training for a school year of not less than thirty weeks. For

a period of less than thirty weeks, a sum proportionately less than \$500 would be the maximum payment allowed, and this would be subject to further proportionate reduction in the event the course is pursued on a part-time basis.

An eligible veteran pursuing a course in an approved institution on a full-time basis is entitled to receive as subsistence allowance \$50 a month if without dependents, and \$75 a month if he has a dependent or dependents. For courses that are pursued on a part-time basis, it is provided that reduced subsistence allowance, if any, will be payable. It has further been determined that subsistence allowance may not be paid to a veteran who is gainfully employed in full-time employment, even though he may be pursuing a full-time course of education or training under Part VIII.

In a telephone conversation, following receipt of this letter from the Veterans' Administration, that part of the answer to question 3, "and in the event of its approval by the appropriate state agency as required by law," was clarified. The approval by the appropriate state agency implies that the curriculum, facilities, and teaching staff must be approved by the state board of education, or comparable state agency, which is directed by law to provide for the state's educational needs. The Veterans' Administration does not plan to approve courses or temporary schools which fail to meet the high standards set up by the respective state boards of education or which lack permanency.



Dental clinic on a hospital ship. New Guinea, 19 December 1942. Signal Corps photograph.

THE RECOGNITION AND TREATMENT OF CUTANEOUS DIPHTHERIA

Small outbreaks of nasopharyngeal diphtheria occurred in military personnel in all of the warm-climate theaters during 1944. These small epidemics were associated with, and in some instances traced to, larger groups of cutaneous diphtheria. In the groups referred to, the skin lesions were proved by competent study to be infected with virulent diphtheria bacilli. In some groups as many as 20 percent of the patients developed characteristic complications due to diphtheritic intoxication.

The term cutaneous diphtheria should be used to designate any lesion of the skin from which *Corynebacterium diphtheriae* of proved virulence is recovered. Such infections potentially possess great epidemiological significance. Yet they are easily overlooked. It is believed that diphtheritic infections of the skin usually arise from nasopharyngeal carriers. Many forms of skin disease have occasionally been found infected, including tropical ulcer, epidermophytosis, eczematoid dermatitis, exfoliative dermatitis, acne, and paronychia. Tropical or desert ulcers are much the most commonly infected. These ulcers are rounded and "punched out." The margins are well defined, thickened, and only occasionally undermined. The base is often relatively clean, but may be covered by adherent, soft, fibrinopurulent material or a dry crust. Beneath the crust there may be gray or gray-green exudate. Insect and leech bites and minor abrasions are the common antecedents of such lesions. Repeated traumata, scratching, infrequent bathing, and over-zealous treatment are factors which may affect the course. In a number of instances, diphtheritic skin infections have spread among troops returning on board ship from combat areas. Small epidemics have occurred in dermatological wards.

Patients with cutaneous diphtheria may serve as the source of infection, not only of the skin lesions of other soldiers, but also of their own throats and the throats of others. Although toxin appears to be absorbed slowly from diphtheritic skin lesions, toxic neuritis and myocarditis are not uncommon. Neuritis develops insidiously and may appear only two to four months after infection. The diphtheria organisms may have disappeared from the skin lesions. Paresis of accommodation with blurring of vision is an important symptom. Loss of taste, dysphagia, hoarseness, paresthesiae, hypesthesia, and loss of deep reflexes and motor function have been reported. The lower extremities are most often involved. On the other hand, manifestations of myocarditis appear suddenly and early.

Diagnosis

The diagnosis of cutaneous diphtheria depends first on thinking of it as a possibility. Suspicion of diphtheria cannot be confirmed and a final diagnosis is not justified unless virulent

From the Medical Consultants Division of The Surgeon General's Office.

diphtheria organisms are recovered or the patients develop characteristic neuritis or myocarditis. Yet, the medical officer must often act on his clinical impression and epidemiological information without awaiting laboratory or clinical confirmation. As previously stated the so-called tropical ulcer is the type of lesion most often infected. Positive cultures are more often obtained from lesions which have existed less than eight weeks than from older lesions. In a few cases with fresh ulcers, the local injection of antitoxin was followed immediately by redness and edema in the area surrounding the lesion.

A knowledge of the endemicity or epidemicity of diphtheria is the most important guide to action. When the disease is endemic, patients with tropical ulcers should be isolated until they are proved to be nondiphtheritic. When diphtheria is epidemic, not only such patients but also those with eczematoïd or exfoliative lesions should be managed in this way.

The laboratory study of possible cases of skin diphtheria must be closely correlated with clinical studies. When the characteristic morphologic structure of *Corynebacterium diphtheriae* is noted in films, it may be considered as presumptive evidence of the presence of the organism. Direct smears of suspected lesions are rarely of great value, but should be employed. Suitable methods of culture and of fermentation and virulence tests are described in paragraph 306, TM 8-227 and in "Diagnostic Procedures and Reagents," 2d edition (American Public Health Association). Proper tests in experimental animals are the only certain method of determining the virulence of diphtheria bacilli.

Treatment

Isolation. Patients with cutaneous diphtheria should be segregated and every precaution taken, as prescribed in AR 40-210.

General. Skin lesions which contain diphtheria organisms should be managed in accordance with accepted therapeutic principles for dermatological diseases. Care should be taken to avoid overtreatment. Diphtheria organisms usually disappear rapidly once bed rest and general and local hygienic care are instituted. Patients with diphtheria of the skin are subject to all the complications that may develop in the nasopharyngeal form of the disease. Accordingly, these complications should be guarded against and treated promptly in case they appear.

Local. The lesion should be appropriately cleaned. The application of sterile warm saline compresses is recommended. Such treatment, combined with general care, usually suffices to clear the lesion of diphtheria organisms, but compresses soaked in penicillin solution (250-500 Oxford units per cubic centimeter) give a quicker effect. The value and necessity for the parenteral administration of penicillin are not clear. Applications of ointments, dyes, and sulfonamides are of no value and may be very harmful. Sulfonamides are also ineffectual when given by mouth.

Specific. The decision to give or not to give diphtheria antitoxin at once should be made according to the clinical impression. When a diagnosis of cutaneous diphtheria appears justifiable on epidemiological and clinical grounds, antitoxin should be given without delay. If a clinical diagnosis is not justified, results of laboratory studies should be awaited. In cases in which only cutaneous lesions are infected and no complication is present, the recommended amount is 20,000 units, administered intramuscularly in a single dose. The usual precautions to prevent anaphylactic reactions to foreign proteins must be rigidly employed. Further administration of antitoxin in such cases must depend on the clinical findings and course. It is to be noted that there is no evidence that antitoxin hastens the healing of skin lesions. Furthermore, antitoxin has no effect on established myocardial or nerve damage. Patients with nasopharyngeal diphtheria as well as cutaneous diphtheria should be treated according to the usual principles for the management of nasopharyngeal diphtheria.



Men preparing to place litter into adapter fastened to pack saddle. New Guinea, 22 May 1943. Signal Corps photograph.

SCHISTOSOMIASIS IN THE ORIENT

Schistosomiasis japonica caused by the blood fluke, *Schistosoma japonicum*, is limited to the Far East and is known also as Oriental schistosomiasis or katayama disease. Several small foci are present in Japan and a few cases have been reported from central Formosa. The infection is common in parts of China, especially the Yangtze valley, the coastal area from Shanghai to Canton, and in the Mekong Valley of Yunnan Province. Foci of infection have been reported from Lake Lindoe and Lake Poso regions in the central Celebes. *Schistosomiasis japonica* is also endemic in several islands of the Philippines which are involved in military operations, where it now constitutes a hazard to the health of the troops.

Soon after the landings in the Philippines, epidemiological investigations were instituted. A parasite survey of 100 stool specimens collected at random from civilians in the Dulag-Palo-Tacloban sector of Leyte showed 34 percent positive for ova of *Schistosoma japonicum*. Snails productive of fork-tailed cercariae, presumably of *S. japonicum*, were collected in rice paddies, streams, and ponds in the Palo and Abuyog municipalities of Leyte. The disease as present appears to be more prevalent in Palo than in 1940. Surveys made prior to the war showed that schistosomiasis was present on Mindoro, the eastern half of Leyte, and northern Mindanao (Surigao, Argusan). A few cases were reported from Samar and from the provinces of Sorsogon, Albay, La Union, Bulacan, and Rizal, and the city of Manila on Luzon. It is uncertain whether or not the disease is endemic in the latter localities.

Schistosomophora hydrobiopsis, a fresh-water snail, is the common intermediate host of *Schistosoma japonicum* in the Philippines. The snail is found in ponds, streams, canals, and rice fields and is frequently associated with decaying vegetation. Because of amphibious habits, the snail may be observed a short distance from water, on mud, mossy stream banks, or partially submerged objects. In water, the larval forms of the schistosome, known as cercariae, emerge from parasitized snails and may infect man by penetrating the skin.

To prevent infection, troops should avoid drinking, wading, bathing, or washing clothes in untreated water. The apparent absence of snails from bodies of water does not guarantee they are free of cercariae. In case of accidental or necessary entrance into water suspected of containing cercariae, immediate bathing with soap and brisk rubbing of the skin with a towel may reduce the chance of infection.

The standard portable (or mobile) sand filter water purification units will not remove all cercariae, but the newly standardized diatomaceous earth filter is effective. Experimental studies with *Schistosoma mansoni* have shown that application of chlo-

From the Tropical Disease Control Division, Preventive Medicine Service, Surgeon General's Office.

rine sufficient to give one part per million residual at the end of thirty minutes' contact will destroy cercariae. It is important to note that this contact time exceeds that normally required in Lyster bag treatment. This means that in some cases an additional ampule of calcium hypochlorite may be required to provide the residual quantity for the greater contact period. When using canteens, two Halazone tablets for clear water and four tablets for turbid or colored water kill *S. mansoni* cercariae. Experimental work on *S. japonicum* is in progress to determine if the above water treatment is effective for this species.

M.A.C. OFFICER CANDIDATE SCHOOLS

The training of candidates for commission in the Medical Administrative Corps continues at Carlisle Barracks, Pennsylvania, with two classes entering prior to 3 February 1945 and additional classes forecast through April. Since 17 November 1944, no classes have entered the Medical Administrative Corps Officer Candidate School, Camp Barkeley, Texas, which is scheduled for inactivation about 15 March 1945. Information reaching the Office of The Surgeon General indicates that considerable misunderstanding exists in the field as to the method of application for officer candidate schools and as to the allotment of quotas. AR 625-5, "Officer Candidates," dated 12 September 1944, states that any enlisted man of the Medical Department who meets the physical standards prescribed for general or limited service enlisted men in MR 1-9 and the current standards for overseas service for limited service officers may apply, provided he has had four months' continuous service, completed basic training in any arm or service, possesses an Army General Classification Test score of 110 or higher, and is not in an alerted unit or under orders for overseas shipment as replacement personnel. Applications will be promptly processed and accepted applicants reported, through channels, to the proper higher echelon listed in paragraph 4c(1) of AR 625-5. No application will be refused consideration on the grounds that quotas have not been allotted to a unit or installation. Quotas to officer candidate schools are allotted on the basis of reported accepted applicants by The Adjutant General and not arbitrarily assigned without previous information.

The ever-growing task which confronts the Medical Department requires an increasing number of competent administrative officers. The principal source of this officer material is the enlisted ranks of the Medical Department, and it is the announced policy of the War Department that "All warrant officers and enlisted men who demonstrate outstanding capacity for leadership and who possess those high qualifications desired in an officer will be encouraged to apply" for training in officer candidate schools. It is the duty of each officer of the Medical Department to do all that he can to stimulate the filing of applications by qualified personnel.

EQUIPMENT MAINTENANCE TECHNICIANS

Difficulties of procurement of elaborate equipment indicate the wisdom of thorough maintenance of such material by trained personnel. Medical equipment maintenance technicians, trained at the Medical Supply Services School, St. Louis, are qualified for this duty. The sixteen-week course covers x-ray machines, dental engines and chairs, sterilizers, diathermy apparatus, operating tables, and other equipment. Classes enter during the first week of every other month in 1945, beginning in February. Application for the allotment of quotas should be made as prescribed in paragraph 109, ASF Manual M-4, "Military Training," dated 20 September 1944.



Making a pressure sterilizer from oxygen tank and other parts of a wrecked bomber. Used in a field hospital in North Africa where it functioned well up to a pressure of seventeen pounds. Signal Corps photograph.

KEEPING UP WITH MAINTENANCE PUBLICATIONS*

Many officers are not familiar with authorized maintenance publications and War Department lubrication orders covering the equipment of their outfits. A motor officer should know what technical manuals and bulletins on maintenance are up to date, and a maintenance officer should be certain that this headquarters has publications that cover equipment pertinent to his unit. A great help in keeping abreast of changes in training publications is the monthly War Department Field Manual, FM 21-6, which lists field manuals, lubrication orders, firing tables, mobilization training programs, technical bulletins, technical manuals, and training circulars. The monthly FM 21-6 includes

*From the Maintenance Division, Headquarters, Army Service Forces.

all changes up to the time of publication. It is like a new telephone directory. The practice of issuing changes in the form of monthly supplements to this manual has been discontinued. Publications issued during previous months are indicated in the current FM 21-6 by an asterisk. It is thus easy to check files. Commanders responsible for maintaining sets of publications are urged to have them checked periodically against the list in each monthly issue of FM 21-6.

Maintenance of a file is required of a commander whether the unit is a company or higher echelon, and that means having on hand the publications which deal with the particular equipment of his unit. Missing publications necessary for the upkeep of equipment of a command should be procured without delay from an Adjutant General depot or other appropriate issuing point. It is suggested that files be carefully checked and requisitions for only missing copies be sent out. Keeping too many copies of a particular manual will deprive another unit of that manual. Units have been known to order whole sets of files when they needed only a few copies.

PROTECTION OF MICROSCOPE LENS FROM FUNGUS

One of the plagues of laboratory workers in West Africa has proved to be a fungus which grows on and between lenses of microscopes, etching the surface of the glass and eventually rendering the instruments unusable. Major Lewis Berner, Sn.C., A. U. S., reports that the most promising method of combating the fungus was described by a civilian doctor who has spent a considerable time in this area. He has found that simply by inserting a small piece of cotton impregnated with creosote in an out-of-the-way corner of the microscope, the fungus was deterred from growing on the instrument. Microscopes treated by his method remained unblemished for years. Care must be exercised in placing the cotton, as creosote tends to remove the black paint from the metal. Once the cotton is in place, it need not be disturbed for as long as a year, when resoaking in creosote is necessary. Camera lens affected by the fungus also can be protected in this manner.

Convalescent Hospital—Revised Program.—The convalescent hospital program outlined in letter, Surgeon General's Office, 4 August 1944, to service commands headquarters has been revised and augmented by ASF Circular No. 419, 22 December 1944. Among other things, this circular includes a number of charts of proposed programs on (1) business education, (2) metalworking, (3) woodworking, (4) agricultural education, (5) graphic arts, (6) electrical education, (7) auto mechanics education, and (8) charts outlining the organization of a convalescent hospital. The circular reviews also the basic principles of reconditioning and outlines the purposes of the various divisions and sections.

BODY ARMOR

A study of the effect of wearing body armor by comparing experience before and after its introduction, and the experience of two groups of heavy bomber combat crew members, one wearing armor and the other not wearing armor, indicates the following: (1) Since the introduction of armor, there has been a reduction of 58 percent in individuals wounded and 60 percent in wounds sustained. At least part of this reduction is considered attributable to the wearing of armor. (2) A study of the location of wounds sustained indicates a reduction of 14 percent in wounds of the head and neck, 58 percent in wounds of the thorax, and 36 percent in wounds of the abdomen. (3) Comparison of individuals struck while wearing armor with those struck while not wearing armor shows a reduction of fatality of thoracic wounds from 36 to 8 percent, and of abdominal wounds from 39 to 7 percent. (4) Body armor prevents about 74 percent of wounds in covered areas.

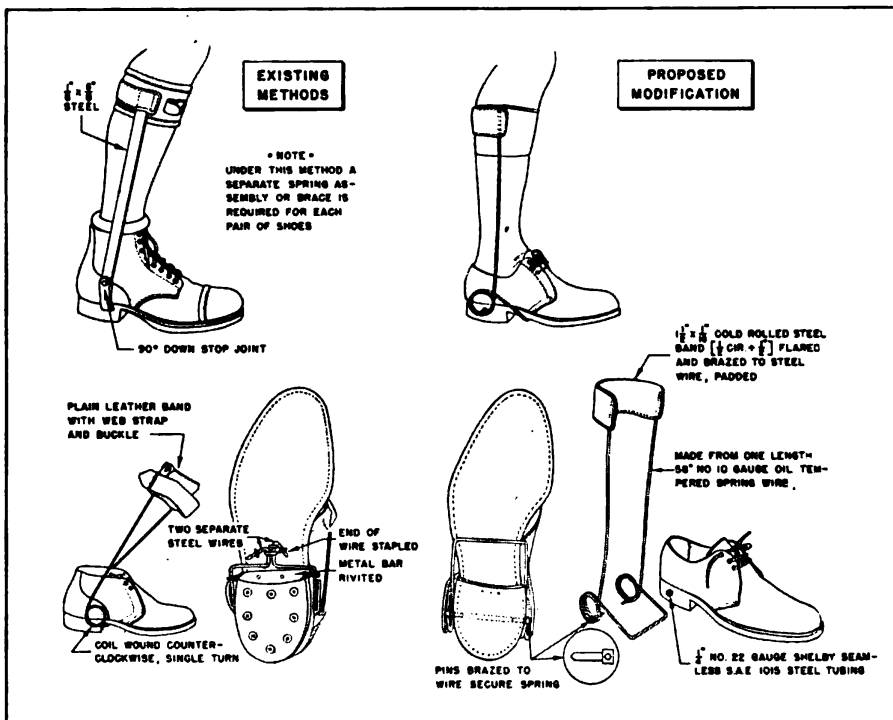
Summary of article by Brigadier General Malcolm C. Grow and Lieut. Colonel Robert C. Lyons, M.C., U. S. Strategic Air Forces in Europe, published in The Air Surgeon's Bulletin, January 1945.



Blood plasma is given to a wounded Marine as his mates administer a stimulant on the beach on Eniwetok Atoll. Coast Guard photograph.

DROP FOOT BRACE

Two types of drop foot brace are in common use: (1) the metal brace with a drop lock ankle. This brace is cumbersome and lacks a spring. (2) The standard wire brace has a spring at the ankle. In this brace, the wire bends and may need replacement. A modification of the latter spring has been designed by Jack R. Pava, orthopedic mechanic, Hoff General Hospital, Santa Barbara, California, in which the upright is placed in front of the coil rather than behind it. Thus the weight of the foot compresses the spring instead of opening it, increases its efficiency, and minimizes the need for replacement due to relaxation of the spring or breakage.



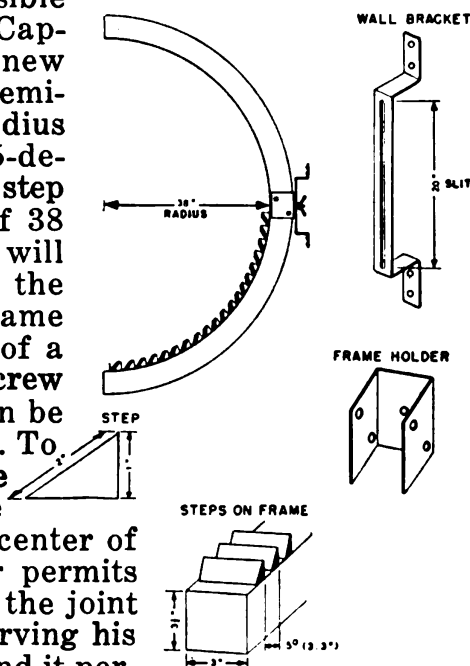
The splint as modified may be worn with different pairs of shoes, being adjusted to a new pair after drilling a hole $\frac{1}{4}$ inch in diameter through the heel of the shoe and inserting a metal tube. This does away with the need for multiple braces and is particularly desirable in cases with bilateral involvement. It also does away with the need for nailing or riveting the crosspiece to the sole of the shoe.

Placing a half metal band around the calf of the leg between the uprights provides comfort and does away with the flexible strap and buckle around the anterior part of the leg, which may allow the brace to twist around the calf. With the half metal band placed posteriorly, the steel uprights remain parallel and lateral to the leg and give even tension to the foot in neutral position.

NEW TYPE SHOULDER LADDER

In treating disabilities of the shoulder joint, it has been customary to use a shoulder ladder attached to the wall in a vertical plane. Physiologically, the movement of the upper extremity in the shoulder joint is not in a vertical plane, but in one of the many planes of a sphere with the joint as its center. To duplicate as closely as possible this movement during exercise, Captain Henry Fleck has devised a new type of ladder consisting of a semi-circular frame of 38-inch radius with steps mounted on it at 5-degree (3.3-inch) intervals. Each step is one inch high. The radius of 38 inches was chosen because it will satisfy the measurements of the average patient. This entire frame moves up and down in the slit of a metal wall bracket by means of a screw and wing nut, and thereby it can be adjusted to the patient's height. To operate the device correctly, the

90-degree step will have to be on a horizontal plane with the center of the joint. This type of ladder permits direct reading of the mobility of the joint in degrees, with the patient observing his own progress from day to day, and it permits exercise in any one of the planes of a sphere. It can be tilted and adjusted in every direction desired.



MEDICAL DEPARTMENT ENLISTED TECHNICIANS' SCHOOL

As the Army nears its authorized strength, the need for certain types of training installations has decreased. Having adopted a policy of retaining those training facilities which permit the greatest emergency expansion, The Surgeon General has begun a program of readjustment of Medical Department enlisted technicians' schools. The demand for increased housing at Letterman General Hospital, which serves as a debarkation hospital, led to closing of the Medical Department enlisted technicians' school there. The Medical Department enlisted technicians' school at Army Medical Center, Washington, D. C., will be inactivated on 31 March 1945, to permit the use of its facilities by Walter Reed General Hospital. The courses for Medical Department officers conducted at the Army Medical School will not be affected.

LIQUID VESICANT CONTAMINATION OF THE EYES

A standard first-aid procedure effective against liquid contaminations of the eye by mustard and lewisite has been the subject of intensive research. The policy (TM 8-285, 15 April 1944, "Treatment of Casualties from Chemical Agents") of irrigation for mustard and using BAL eye ointment for lewisite has the disadvantages of requiring the soldier to remember two forms of first aid, to make an immediate decision on the spot as to the type of contaminating agent and then apply correctly the first-aid procedure recommended. Intensive research on this problem has produced a first-aid procedure which may be used for liquid contaminations by either mustard or lewisite or mixtures thereof. In studies thus far the new method has given similar or better results than either of the former procedures.

The new first-aid procedure incorporates the use of BAL eye ointment* and irrigation. Immediately after the eye has been contaminated by a liquid blister gas, BAL eye ointment is squeezed directly into the lower conjunctival sac. The eye is then massaged for one minute. This is followed by irrigation with water from the canteen or other available uncontaminated source. The water should be poured directly and slowly into the eye and should be continued *for at least thirty seconds*, or until the canteen is empty, and not longer than two minutes. Field trials with volunteers have proved that soldiers are able to instill BAL eye ointment into their own eyes and follow it with proper irrigation with water from their own canteens in time to achieve the desired results. If BAL eye ointment is not immediately available, the eye should be irrigated as early as possible without waiting to obtain the ointment. Decontamination must be completed before the gas mask is put on, in spite of the presence of vapor; therefore, the individual should hold his breath as much as possible until the decontamination is completed and the mask can be adjusted. BAL eye ointment placed in an uncontaminated eye is quite irritating and causes immediate stinging and blepharospasm which may interfere with the individual's combat ability for fifteen minutes; therefore, BAL eye ointment should be used in the eye only when the individual is fairly certain that his eye has been contaminated by liquid blister gas. The chance of liquid contamination is slight except when in the close vicinity of a shell or bomb burst or in a direct airplane spray.

Liquid mustard in the eye causes no immediate pain or discomfort. When BAL eye ointment is placed in an eye contaminated with this agent, there will be immediate irritation and blepharospasm. *This is to be expected and decontamination should not be discontinued because of it.* The irritation from the ointment stops as soon as the irrigation is begun; however, the irri-

From the Chemical Warfare Branch, Surgical Consultants Division, Surgeon General's Office.

*BAL ointment, $\frac{3}{4}$ -ounce tube (Med. Dept. Item No. 9102800) may be used. The contents of BAL eye ointment (3-gram) and BAL ointment ($\frac{3}{4}$ -ounce) tubes are qualitatively identical.

gation should not be stopped as soon as the stinging disappears, but should be continued for the length of time outlined earlier in this article.

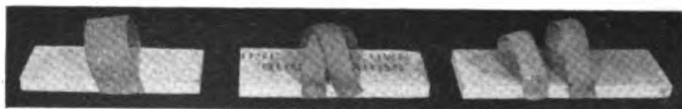
When liquid lewisite is the contaminating agent, the immediate pain and blepharospasm caused by the agent is rapidly relieved by the instillation of BAL eye ointment. The blepharospasm may be so great as to preclude the instillation of ointment into the lower sac immediately. In such cases ointment may be put on the outer lids and massaged well to work some of the ointment between the lids into the eye. This will relieve the pain and blepharospasm to such an extent as to permit the direct instillation of the ointment into the sac.

In contaminations by liquid mustard the initiation of first aid within the first few seconds is markedly effective and after two minutes is of very little value. In the case of lewisite contamination BAL eye ointment is effective for a longer period of time. If used within one minute after the contamination, the eye usually recovers in a few days. When used ten minutes after contamination the eye requires several weeks to heal and usually suffers permanent damage. After thirty minutes BAL eye ointment has almost no effect.

The prescribed first-aid can also be used for liquid contaminations by nitrogen mustards, phenyldichlorarsine, and ethyldichlorarsine.

IMPROVISED CLOGS

Athlete's foot has been a cause for concern among all arms and branches of the service, and various attempts at prevention have only in part reduced the incidence of infection. Contamination of the feet is most likely to occur in damp places such as showers and latrines and barracks where soldiers go barefooted. The wearing of clogs would reduce contact with contaminated surfaces and thus lower the incidence of athlete's foot among



troops. Wooden clogs are easily constructed from salvage. The materials required are scrap lumber, salvaged waist or pistol belts, and nails. The wooden base can be cut into three standard sizes: 9 by 4 in.; 10 by 4 in.; and 11 by 4 in. The salvaged belting strips are cut into two sizes, 11 in. and 9 in. in length. Eight nails are usually sufficient per pair.

The clogs should be fitted individually. The soldier exerts his full weight on the unfinished clogs, while his partner does the fitting and nailing of the strips to the base.

From Captain Jacob A. Glassman's paper: "Proposed Plan for Prevention of Ringworm in the United States Army."

JAPANESE B ENCEPHALITIS VACCINE

The Surgeon General has approved the procurement of a supply of Japanese B encephalitis vaccine to be used for the protection of United States troops who may encounter this disease. Japanese B encephalitis is a highly fatal virus disease transmitted by several species of *Aedes* and *Culex* mosquitoes. It is known to occur in Formosa, Japan, Thailand, in the region of Vladivostok, in the Maritime Province, along the Russian Manchurian border, and may occur anywhere along the China coast north of Shanghai and inland. The seasonal prevalence is in the summer and early fall.

The Russians, who have encountered the disease along the Manchurian border, have reported favorable results with use of a vaccine produced from the brains of mice infected with the virus. Both the morbidity and mortality of the disease appear to have been considerably lower among Russian troops who have gone into epidemic areas after vaccination as compared with the morbidity and mortality among unvaccinated individuals in the same areas.

The vaccine being produced for the U. S. Army is also a mouse brain vaccine and was developed in 1942 by the Commission on Neurotropic Virus Diseases of the Army Epidemiological Board. Its use will be limited to troops who will enter areas where the disease is known to be epidemic.

INADVERTENT INJECTION OF SODIUM PENTOTHAL INTO AN ARTERY*

Although the inadvertent injection of sodium pentothal into an artery has not been recorded by medical officers of the U. S. Army, a few instances of this error have been observed by the British. The following note of warning, extracted from a British report, should interest medical officers whose duties include the performance of venipuncture for the administration of this anesthetic agent:

Inadvertent injection of pentothal into an artery has more than once given rise to gangrene of the hand and fingers. The mistake may occur in one of two ways:

(a) An aberrant ulnar artery running between skin and fascia may be mistaken for a vein.

(b) During the search for a vein in the plump ante cubital fossa the needle may pass too deeply and enter the brachial artery.

To obviate such a serious mistake, it is recommended that (1) the color of the blood should be carefully observed before injection starts; (2) a pause of a few seconds should be made after injection of a minute quantity of pentothal. If no pain occurs, it may be assumed that an artery has not been penetrated.

*Extracted by the Surgical Consultants Division, Surgeon General's Office, from Colonel F. S. Gillespie's Circular Letter No. 16, dated 1 December 1944.

DEVICE TO AID VENEREAL PROPHYLAXIS

The stool illustrated adds to the convenience and effectiveness of administering a venereal prophylaxis. It is placed with the trough over the edge of the ordinary toilet bowl. The patient removes his trousers and straddles the seat in which position he may thoroughly wash and rinse the abdomen, thighs, and genitalia without soiling his clothes, and the medications may be administered with ease.

The stool can be made from scrap lumber and painted with a hard-surface white paint. Two of these stools have been in use at prophylactic stations in the area surrounding

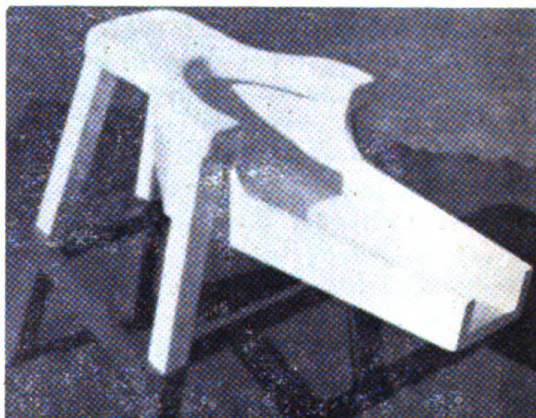


FIGURE 1. Prophylactic stool.

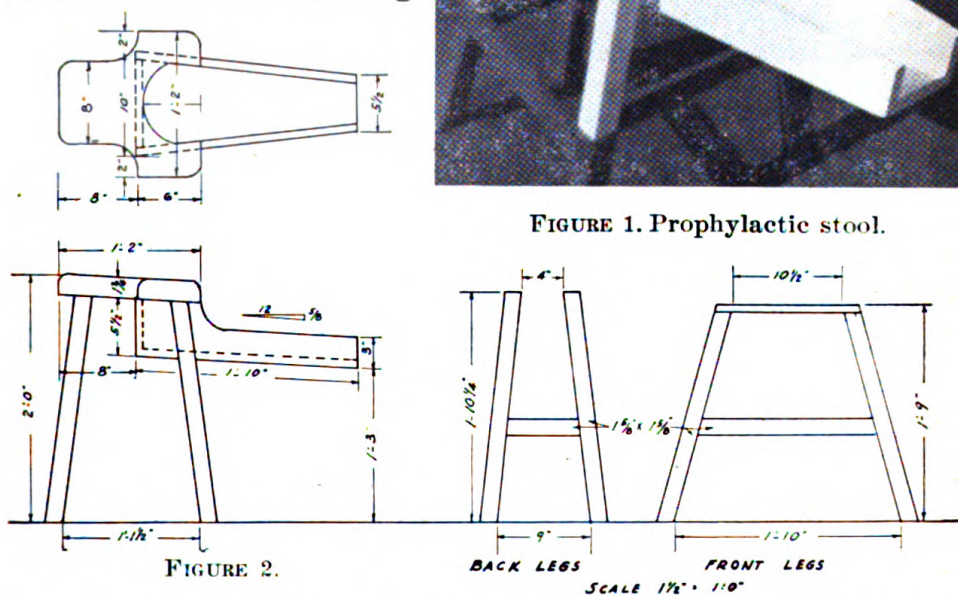


FIGURE 2.

BACK LEGS
FRONT LEGS
SCALE 1 1/2" = 1'-0"

Camp Beale, California, for about two years. Captain B. Brandt Bartels, M. C., who devised the stool, believes it has done a great deal to increase the number of prophylaxes and, in the end, has prevented many cases of venereal disease.

VENEREAL DISEASE RATE IN UNITED STATES

The provisional venereal disease rate for the Army in continental United States for 1944 is 34 per 1,000 per annum, an increase over the all-time low rate of 26 established in 1943. The increase in 1944 was entirely in gonorrhea with a rate of about 29 per 1,000 per annum. The syphilis rate, about 4 per 1,000, is the lowest ever recorded for the U. S. Army. All other venereal diseases constitute a rate of about 1 per 1,000.

From the Venereal Disease Control Division, Preventive Medicine Service, Office of The Surgeon General.

The increase in the gonorrhea rate during 1944 may be attributed to a number of reasons: (1) indications are that there may be an increase in the incidence of gonorrhea in the civilian population; (2) a shortage of well-trained venereal disease control officers in the United States, many having been given assignments overseas; (3) troops returning from overseas have had an abnormally high venereal disease rate of infection acquired after arriving in this country; (4) the outstanding advances in therapeutic methods climaxed by the introduction of penicillin have resulted in better reporting of venereal disease with a decrease in the amount of concealed gonorrhea, and a definite but as yet unmeasured effect on the will of the soldier to avoid venereal disease; (5) repeal of the law which provided for loss of pay for time lost because of venereal disease has probably brought an increased number of soldiers reporting with venereal disease to their medical officer instead of resorting to self-medication, concealment, or attending private physicians.

MENINGOCOCCAL ARTHRITIS

Certain features of meningococcal arthritis which set it apart from other types of infectious arthritis have been observed by Beckman and Ropes. Ten of thirty-four cases of proved meningococcal infection had articular involvement, an incidence considerably higher than has been reported. In every case in which joint involvement occurred, meningococci were grown from the blood stream and in all but one a typical purpuric skin rash was present. The arthritis was usually asymmetrical and, in general, involved only one or two of the larger joints. The affected joints were swollen and sometimes limited in motion, but in no case were they red or hot. Pain was slight and at times the patient was not aware of joint disease until it was pointed out on physical examination. This was in distinct contrast to the evidence of inflammation in the synovial fluid where leukocyte counts ranging between 760,000 and 42,000 were found at the time of the first observation. Another striking characteristic of this arthritis is its failure to respond to sulfonamide therapy. In every case, the meningitis and septicemia responded rapidly to the drug, but the arthritis persisted and, indeed, on two occasions developed after the other signs of meningococcus infection had subsided. Two cases were treated with both sulfonamides and antimeningococcic serum and the arthritis lasted less than one week in both cases. It is possible that serum may be the method of choice for combating meningococcal arthritis.

Abstract of an article entitled "Meningococcal Arthritis: A Clinical Study," by W. W. Beckman and M. W. Ropes, published in the *Journal of Clinical Investigation*, November 1944, page 950.

Army Medical Museum Seminar.—At the weekly seminar at the Army Medical Museum, Washington, D. C., 13 January, Dr. Benjamin Schwartz, chief of division of zoology, U. S. Department of Agriculture, discussed "Trichinosis."

PORTABLE EXERCISE CART

The portable exercise cart illustrated is useful in building the physical stamina of patients in the class III and IV reconditioning program. This apparatus can easily be moved from one ward to another and still give nearly all the equipment of a small gymnasium. This is especially beneficial for patients who cannot do much walking and yet have energy for some other physical activity.

Where lack of personnel is a problem, one or two men from the advanced reconditioning program can push the cart from ward to ward and set it up for use in five minutes (figure 2). Second Lieut. Robert E. Strzelczyk, M.A.C., reports that the portable cart has been found excellent for physical training supplemental to the ordinary routine calisthenics.

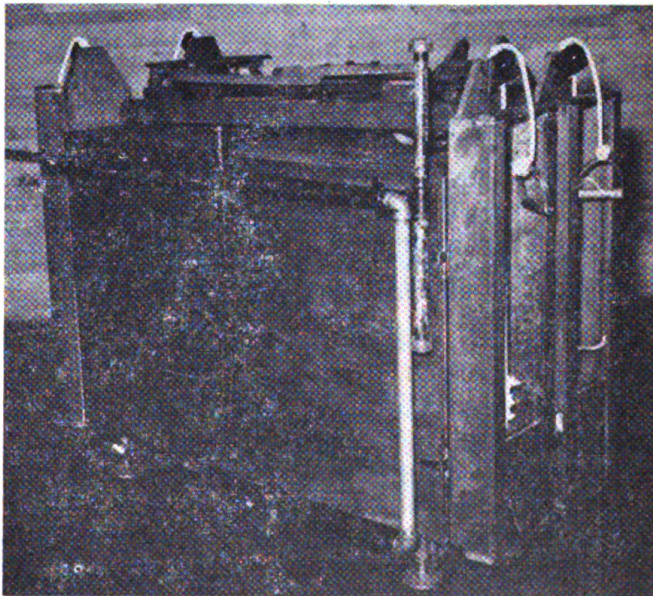


FIGURE 1. Assembled portable exercise cart ready to be pushed from one ward to another.

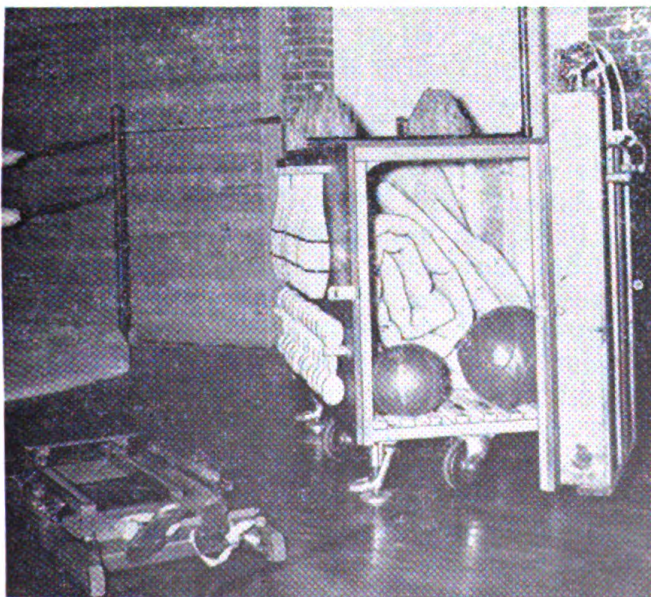


FIGURE 2. Exercise cart showing equipment and storage space.

The detachable equipment has psychological as well as physical effects. A person enjoys physical activity more when he can have some apparatus in his hands. A man who is able to lift an Indian club only ten times today, then twelve times tomorrow, through a personal challenge to do more, will have both his morale and his physical capacity benefited. This can be accom-

plished by bringing such equipment to him and thus his energy can be expended more wisely and efficiently.



FIGURE 3. Practical application of portable exercise cart.

The portable cart which can be easily constructed in the occupational therapy or post engineer shop is capable of providing exercise for forty-five to fifty men. The equipment consists of twelve 1-pound dumb-bells, twelve 2-pound Indian clubs, one 4-by-5-foot tumbling mat, one rowing machine, six hand grippers, three cable exercisers, twelve skipping ropes, two sets of wall pulleys, two medicine balls of 6- and 10-pound weight, and one collapsible chinning bar.

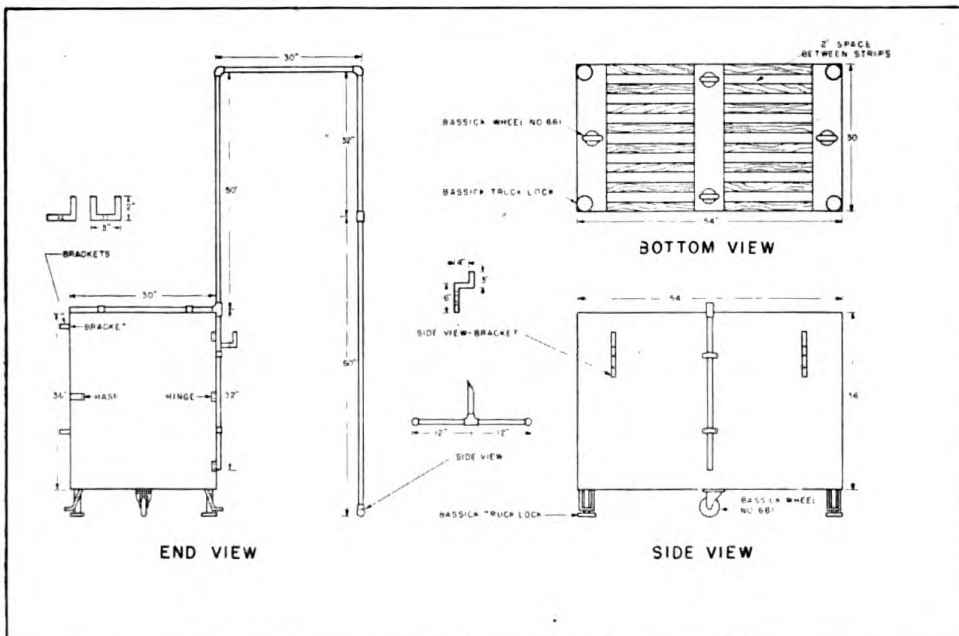


FIGURE 4.

The cart is constructed of $\frac{3}{4}$ -inch plywood and reinforced with 2 by 4 lumber. The floor of the cart has strips of wood one inch wide, spaced equidistant for ventilation and sanitation. The brackets which hold the Indian clubs and dumb-bells are made from salvaged strap iron pipe hangers cut and bent to required size. The chinning bar is made from salvaged pipe and joints; the wall pulley weights are made from salvaged lumber and then weighted with bricks or cement and inclosed in a wood box to facilitate easier sliding motion.

HEALTH OF THE WAC

Stations in the zone of the interior with more than 300 WAC personnel have, since April 1944, submitted separate reports on the health of such personnel. These reports cover about 40 percent of the total strength and present a comparative picture during the spring, summer, and fall.

During the nine months ending 31 December 1944, the admission rate from all causes in the WAC was 969 per year per 1,000, about 65 percent higher than that for all Army personnel. The admission rate from disease was about 75 percent higher, while that from injuries was practically the same; however, a large proportion of the injuries among the WACs were relatively minor ones. The higher morbidity as compared with that of men reflects the well-known fact that sickness rates among women are considerably higher than for men. Statistics on absenteeism in industry during the 1930's showed the rate of absenteeism for women to be more than 60 percent higher than for men. Insurance company studies also indicate that morbidity rates for women are from 50 to 100 percent higher than for men. It is, therefore, not surprising to find that admission rates for the WAC have been higher than for men.

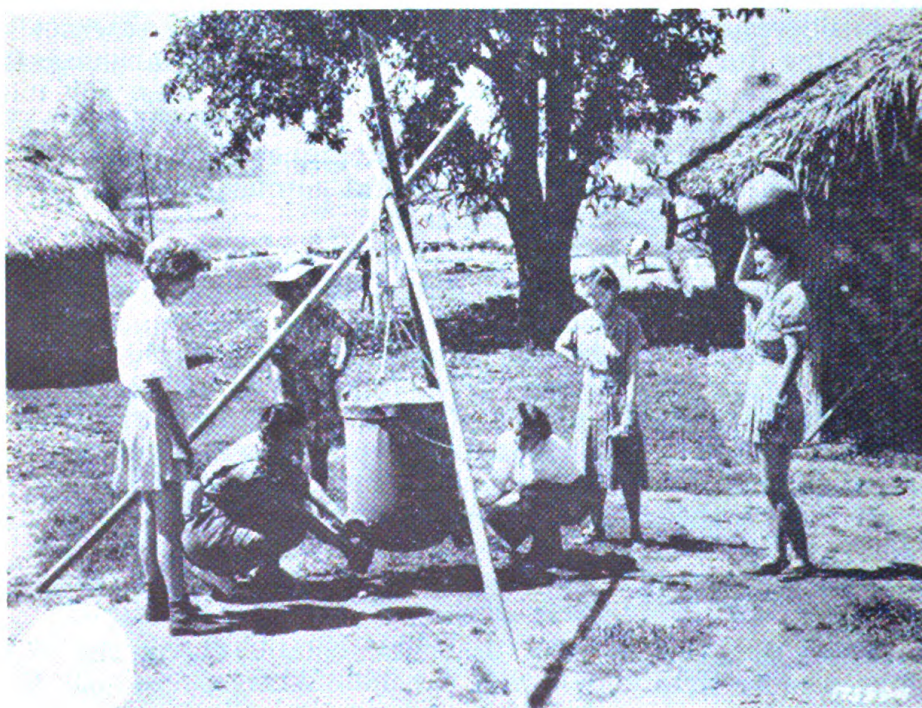
The indications are that most of the excess morbidity from disease in the WAC is due to minor ailments. The admission rate for colds, influenza, etc., during the nine-month period April to December 1944 was about 70 percent higher for the WAC than for men. Reports from industry for 1942 and 1943 show that the annual number of absences on account of colds, influenza, etc., per 1,000 industrial workers was more than 80 percent higher for women than for men. A recent study presented before the American Academy of Ophthalmology and Otolaryngology stated that women were half again as likely to get colds as men and that the average woman lost 4.9 days a year from colds while the average man lost only 2.7 days.

The admission rate for diarrheal complaints in the WAC has been more than double that for male Army personnel. This is also true with the experience in industry. While information

From the Medical Statistics Division, Professional Administrative Service, Surgeon General's Office.

is not now available as to the extent of morbidity in the WAC traceable to gynecological disorders, these conditions accounted for about 71½ percent of the absences among female personnel in industry during 1942 and 1943. On the other hand, the incidence in the WAC of pneumonia, mumps, scarlet fever, rheumatic fever, and tuberculosis has been markedly lower than among men. Measles appears to be the only common communicable disease for which the admission rate in the WAC was higher than for men.

That most of the excess morbidity in the WAC can be accounted for by such conditions as colds and influenza, diarrheal complaints, and gynecological disorders is reflected in the fact that a relatively high proportion of all WAC admissions receive all their medical treatment in quarters. The admission rate to hospital, which can be considered as a measure of more serious illness or injury, has been much the same for the WAC as for male Army personnel. The number of WACs remaining in station and regional hospitals per 1,000 strength has been somewhat less than for other Army personnel. This implies a shorter average duration of hospitalization for the WAC (which corresponds to a shorter average period of absence for women in industry) and bespeaks less serious reasons for hospitalization than in the case of men.



American nurses off duty in India fill their canteens from a Lyster bag. All drinking water is boiled before it is distributed. August 1943. Signal Corps photograph.

ASSIGNMENT ON RETURN FROM OVERSEAS

Officers now serving overseas in Medical Department activities apparently have a tendency to believe that when returned to the United States under the rotation policy or otherwise they will be immediately placed in a unit earmarked for early movement overseas, or they will remain idle in "pools" for long periods of time, as officers for whom no suitable assignment is available. Such impressions are based on erroneous rumors. The impression regarding pool assignments may be based on a state of affairs which existed earlier in the war wherein Medical Department affiliated units were called to active duty and could not be functionally employed for long periods of time. Officers were assigned to other units which also were not earmarked for immediate active duty in a theater.

The surgeons of all theaters, and through them all technical echelons of the Medical Department, can be assured that this situation does not exist. The Military Personnel Division is making every effort to:

1. Reassign individuals promptly on completion of their leave and subsequent report to a personnel redistribution station (ZI), even to the extent of having orders awaiting them on arrival at such stations.

2. Develop a long-range program of assignments by having immediately available a record of vacancies or planned vacancies in their priority of importance.

3. Replace with returnees from theaters individuals now serving in all types of Medical Department (ZI) activities who are qualified for general military service or limited service overseas.

4. Assign officers to "in service" professional training courses who have been on administrative or nonprofessional duties for twelve months preceding rotation if the military situation will permit. These courses will be available when requested by returnees for overseas.

Three priorities of replacements for rotation of personnel are established by War Department Circular No. 8, 1945: (1) those who have not been overseas; (2) those who have been overseas and returned to the zone of the interior for the longest period of time; (3) all others. Obviously military necessity will govern the execution of these plans, but all concerned should be advised of The Surgeon General's appreciation of the services rendered in the theaters and the War Department's realization of its obligation to the individual.

Officers returning to the United States for ordinary leave, emergency leave, temporary duty, or rest and recuperation leave, frequently state that the surgeon of the theater or his representative has stated that they can be reassigned within the zone of the interior if The Surgeon General so desires. This office is not allowed to request the assignment of such individuals except in unusual and emergency cases. In the event that the

From the Military Personnel Division, Surgeon General's Office.

theater surgeon concurs in the assignment of such officers to the zone of the interior, proper notification of such release should be sent through military channels to the War Department in ample time.

CARBON TETRACHLORIDE POISONING

Fifteen men assigned to degrease guns with carbon tetrachloride, after preliminary cleansing with gasoline, worked at a bench on which was a tray containing 1 to 2 quarts of carbon tetrachloride. In the large stove-heated room were two windows and a door which were kept open. Nine of these soldiers became acutely ill in the late evening of the second day, but all fully recovered within forty-eight hours, except a soldier, 22 years of age, who progressed to renal insufficiency. This patient's history revealed no significant illness except that for some years he had consumed large amounts of hard liquor.

He complained of dizziness, loss of appetite, and malaise after the second day's work and went to bed without supper, waking five hours later weak, nauseated, with pain in his legs, temperature 102° F., pulse 128, respiration 24. On the third day he had also abdominal pain and distension, and oliguria. On the seventh day his condition seemed critical. A superficial scratch bled profusely, and a brisk nosebleed followed picking the nose; however, manifestations of a hemorrhagic diathesis were not noted after the ninth day. He had cough with bloody mucopurulent sputum. The x-ray disclosed patches of bronchopneumonia. From the eleventh to the eighteenth day there was a striking diuresis. On the sixteenth day, the x-ray showed clearing of the pneumonia and a normal heart. From the twenty-third day the patient was able to tolerate protein of 90 grams and fat of 60 grams. Clinical improvement was rapid and all evidence of liver and kidney damage had disappeared at the time of his return to full duty after forty-five days of hospitalization that included a sick furlough.

Carbon tetrachloride frequently shows a clinical picture in which kidney damage is predominant. It is said to be more toxic to the kidney when liver function is abnormal, as in hepatic cirrhosis. The influence of alcoholism on kidney susceptibility is impressive, but in the case reported here the factor of alcoholism possibly was counteracted to some extent by the patient's large daily consumption of calcium in six to eight glasses of milk which he drank daily in addition to liquor.

Increasing reports of carbon tetrachloride poisoning indicate a universal lack of familiarity with its toxicity. The author emphasizes that the generally accepted figure of allowable concentration of carbon tetrachloride is four times too high. As to treatment, it is of the greatest importance to promote

Abstract of an article by Captain Victor H. Kugel, submitted through The Surgeon General's Office for publication in the Journal of the Mt. Sinai Hospital, New York.

and maintain urinary output at about 1,500 cc. a day, but if the output declines, extreme care must be taken not to drown the patient in his own fluids for, despite such precautions, heart failure and pulmonary edema may develop. Ten percent glucose by vein is the conventional solution employed; where glucose is used, thiamin chloride is theoretically indicated. Experimental evidence is available to indicate that calcium protects an animal with extensive liver damage against carbon tetrachloride poisoning. The hemorrhagic tendency can be combated by parenteral vitamin K and transfusion. High carbohydrate diet in the recovery phase, with high protein as soon as it is tolerated, combats liver damage and aids in rapid restoration to normalcy.

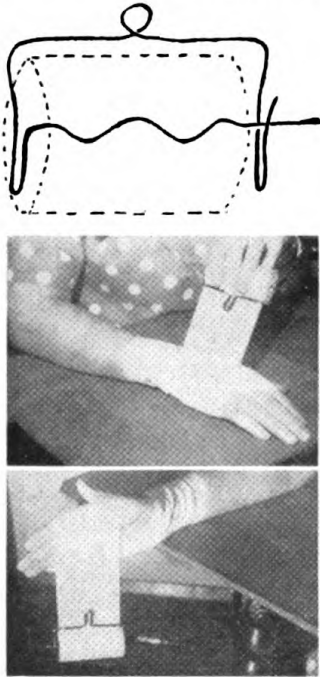
IMPROVISATIONS IN TANK DESTROYER BATTALION

The standard medical chests are not always ideal for medical detachments of motorized units operating under special conditions. Captain George Gittell, M.C., reports that, in his battalion, certain improvisations were tried in an effort to make the aid station more mobile and prepared to give medical service at any time.

The authorized transportation for the aid station equipment and medical personnel of the battalion was a 1½-ton truck with a 1-ton trailer. The bows and tarpaulin of the vehicle were lengthened, making it possible for a person to stand erect in the truck. An automobile headlight was installed in the rear of the vehicle, and it was made reasonably light-proof. A removable litter rack was installed along one side of the truck, its long axis parallel with that of the vehicle. This made it possible to examine and treat a recumbent patient more conveniently. To hold medical supplies, a chest was built with drawers on one side and shelves and racks for bottles on the other. This chest, installed just behind the driver's seat, contains a sufficient stock of dressings, drugs, and instruments for both surgical emergencies and for the customary sick call. Additional supplies are kept in compartments in the seats of the rear of the truck.

The medical chests, containing a further reserve stock of dressings and drugs, and other items rarely required, are kept in the trailer with baggage belonging to the personnel. Thus, the truck itself is kept relatively clear, so that it is ready for use on very short notice after a march or even on a march in emergencies. Also, the vehicle can be prepared for movement at least as rapidly as the rest of the unit.

These improvisations were made from salvaged materials. The chest was constructed from the wood of discarded shell boxes. It is suggested that the equipment issued to this type of medical unit be modified to the needs of a mobile combat unit, along the lines indicated. Such an adaptation would not increase the bulk of the equipment but would greatly increase its usefulness.

NONSLIP ROLLER BANDAGE CLIP

This clip was devised to prevent the accidental unwinding of roller bandages during their application and the uncontrollable rolling of the bandage all over the floor. With this clip, Captain George O. Baumrucker, M.C., reports, the bandage will unroll freely but will not unwind if dropped. It allows more speed in bandaging and reduces to a minimum unnecessary clumsiness, contamination, and waste of bandage material. The clip serves also to guide the bandage quickly and evenly back on itself when rewinding the bandage. Simply and inexpensively constructed, it can be furnished with or applied to any kind of roller or elastic bandage.

Showing (1) bandage clip in place; (2) ease in applying bandage; (3) that clip prevents unwinding if bandage is dropped.

POTASSIUM CHLORIDE AND PERIODIC PARALYSIS*

A young infantry officer, wounded late in 1943, was active and ambulatory and expected to be evacuated to North Africa the next day for further treatment; however, in the morning he was unable to lift either leg or move feet or toes. The left forearm was in a cast. The left biceps contracture was stronger than the right. All other deep tendon, periosteal, and superficial reflexes were absent. He was amused at the interest shown in his case and indifferent toward the paralysis, remarking, "Several generations of my family have had this paralysis periodically and all I will need is some potassium chloride." He took a tablespoonful of the crystals and within an hour the deep tendon reflexes returned, the superficial ones, in an hour and one-half; in two hours he was up and very active. Now he is back in active service.

This officer over a period of years had many similar attacks of paralysis, some lasting for twenty-nine hours. His case had been diagnosed variously as "Hysteria," "Nothing wrong anywhere," "Physically O.K.; no treatment recommended." A non-military clinic, however, having made a "new diagnosis," the patient started taking potassium chloride.

In almost four years in the Army, he had been a corporal, sergeant, expert with pistol, M-1, '03, LMG, grenade, bayonet, and in mine and demolition work. He had been wounded once

*Abstract of paper by Major Joseph W. Johnson, Jr., M.C., submitted through The Surgeon General's Office to The New England Journal of Medicine.

before and has since been wounded a third time, promoted, and awarded the Bronze Star and the Silver Star. He carried a four-pound sack of potassium chloride in his bedding roll and quarter-pound sacks in his combat clothes but, when wounds brought him to the hospital, his potassium had been left behind. He has observed that when on high carbohydrate diet, more potassium chloride is required, more when on B rations than when on C rations, and also more in summer. He carries two canteens of water to wash down the crystals of potassium chloride, taken ordinarily every two to nine days. Sometimes he goes for a month without any, taking it only when he feels himself "stiffening up."

The patient's father died in an attack of family periodic paralysis at the age of 37. He, too, realized the hereditary nature of his ailment. A chart compiled from data "in the letters" shows that nine members in various generations in this family have been afflicted with this disease.

MEETING OF PSYCHIATRISTS

A conference of 38 psychiatrists from the consultation services (mental hygiene clinics) in the basic training camps of ASF and AGF was held recently at Aberdeen Proving Grounds; in attendance also were representatives of the ASF Training Division, the Replacement and School Command of the AGF, Psychological Branch, AGO, The Judge Advocate General's Office, the Neuropsychiatry Consultants Division of The Surgeon General's Office, and the Medical Corps of the Canadian Army. Only one session was given to formal papers, the others being devoted to free discussion of problems met daily by the consultation service psychiatrists.

Brigadier General Arthur Trudeau keynoted the meeting in presiding over the discussion of the role of the consultation service in training when he stressed preventive psychiatry. Colonel Lloyd J. Thompson, chief psychiatrist of the European Theater of Operations, and Major Calvin Drayer, neuropsychiatric consultant to the Fifth Army, presented valuable material on combat psychiatry.

The meeting was directed by Colonel William C. Menninger, director, Neuropsychiatry Consultants Division, Surgeon General's Office. The Command of Aberdeen Proving Grounds expertly looked after organizational details and the physical comfort of those who attended the conference.

Medical Supplies in Pacific Theaters.—Mr. C. W. Harris, consultant for storage to the Director of Supply, Surgeon General's Office, having recently returned from the Pacific theaters of operations, reports that medical supplies received in those theaters are the envy of all technical services with respect to being received on time, in the proper quantities, and in first-class condition as to packing and packaging.

CONVALESCENT RECONDITIONING

Restoration is at least as much a matter of spirit as of body, and must have as its central truth:—Body and spirit are inextricably conjoined. To heal the one without the other is impossible. If a man's mind, courage and interest be enlisted in the cause of his own salvation, healing goes on apace, the sufferer is re-made; if not, no mere surgical wonders, no careful nursing, will avail to make a man of him again. Therefore I would say: "From the moment he enters the hospital, look after his mind and his will; give him food; nourish him in subtle ways; increase that nourishment as his strength increases. Give him interest in his future. Light a star for him to fix his eyes on, so that, when he steps out of the hospital, you shall not have to begin to train one who for months, perhaps years, has been living; mindless and will-less, the life of a half-dead creature."

That this is a hard task none who knows hospital life can doubt. That it needs special qualities and special effort, quite other than the average range of hospital devotion, is obvious. But it saves time in the end, and without it success is more than doubtful. The crucial period is the time spent in the hospital. Use that period to recreate not only the body, but mind and will power, and all shall come out right; neglect to use it thus and the heart of many a sufferer and of many a would-be healer will break from sheer discouragement. A niche of usefulness and self-respect exists for every man however handicapped; but that niche must be found for him. To carry the process of restoration to a point short of this is to leave the cathedral without spire. To restore him, and with him the future of our countries, that is the sacred work.

Statement by John Galsworthy made at the Allied Conference on the After-Care of Disabled Men, Washington, D. C., in 1919. Reprinted from the Report of the Baruch Committee on Physical Medicine, April 1944.



U. S. Army nurses in Wales run for cover behind a concrete wall at the sound of air alert alarm. A moment before, they were getting physical therapy training. Signal Corps photograph.

APPARATUS FOR TRANSPORTING WET X-RAY FILMS

It may be advisable occasionally to examine x-ray films before they have become dry. Wet films may be sent to the operating room, the cystoscopy room, or to other departments for interpretation during some examination or procedure. The radiologist, also, may require that wet films be brought to his office for immediate interpretation or inspection of technique, before dismissal of the patient. Wet films transported thus frequently rub against each other and are damaged. While radiologists have at times discouraged wet film transportation and reading, Captain Harold H. Sage, M.C., believes this

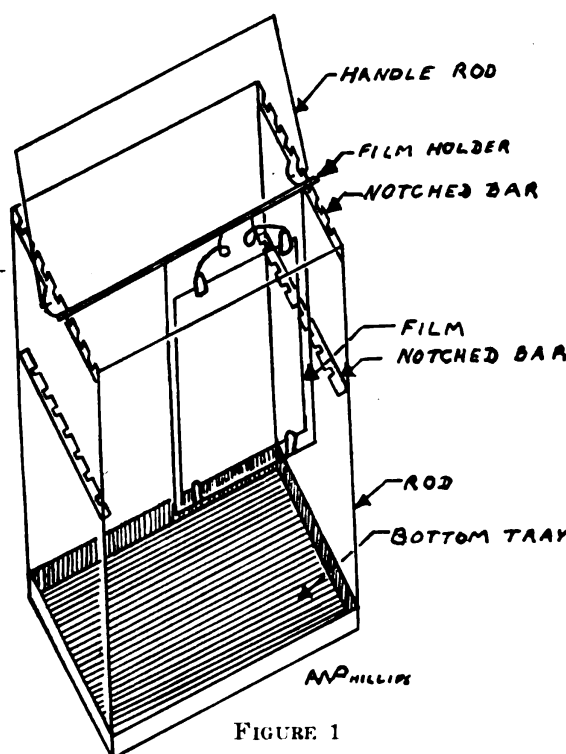


FIGURE 1

should be encouraged in cases such as those noted, and he has devised an apparatus to transport wet x-ray films in their holders. It consists of a rectangular bottom tray, 2.5 cm. deep, 39.0 cm. long, and 27.0 cm. wide, to the corners of which are soldered four rods 54.0 cm. high (figure 1). The upper ends of the four rods are connected lengthwise by two other rods, and from side to side by a notched bar. There are seven notches, each 0.7 cm. wide, spaced 2.5 cm. apart. The standard x-ray film holders fit snugly into these notches. Two similarly notched bars span the rods sidewise, 20.0 cm. below the top, to form a slot effect for the film holders. A

handle rod for carrying purposes surmounts the apparatus and is inserted into holes in the connecting bar.

The apparatus used was made of iron. It weighs 5 pounds but could be made of lighter material which, however, should be resistant to water and chemicals used in processing films. A towel under the film while viewing it serves a useful purpose.

Corporal Curtys B. Isaacson rendered technical assistance.

Camp Barkeley, Texas, has been changed from a Class II to a Class I installation. Brigadier General Roy C. Heflebower, who has been commanding general of Medical Department training at that post from its inception in December 1941, has been placed in command of the camp, which at present is an Army Service Forces training center used exclusively for Medical Department training.

CONSTRUCTION OF A TRANSLUCENT SCREEN

The need for a translucent screen for lectures, demonstrations, and teaching slides, at Lawson General Hospital, was easily met. Major John L. Barner, M.C., reports that two pieces of three-quarter-inch glass, 30 by 45 inches, were obtained and between them was carefully sandwiched a sheet of extra-quality drafting paper of the semi-parchment, translucent type. Then the edges were bound with cellulose tape, similar to the binding of a lantern slide, making the area between the two glass panes airtight and dustproof.



The finished bound sheets of glass were supported in a frame of $\frac{3}{4}$ -inch wood, constructed to hold the glass firmly and to allow slotted grooves on each side in which slipped protective sheets of plywood.

The frame has two legs and can be placed on a table when in use. A projector placed behind the screen, bringing the screen between the audience and the projector, will give a more unobscured view, less glare, and a sharper image than a beaded or plain wall screen. Also the demonstrator can, when seated at the

projector, see the image on the screen and with a fine wire stylet point out areas of interest on the slide for the benefit of the audience. While the idea is not original, its application in this manner may fulfill the needs of clinics and lecture halls.

VETERINARY UNIT HONORED

The Commanding General of the Seventh Service Command has awarded the Meritorious Service Unit Plaque to the MEDICAL DETACHMENT, VETERINARY SERVICE, 1745th SERVICE COMMAND UNIT, Fort Omaha, Nebraska, for superior performance and outstanding devotion to duty in connection with food inspection activities. The citation declares that "this unit achieved and maintained a high degree of military and professional efficiency throughout a period of two years as evidenced by superior individual conduct of its personnel, high *esprit de corps*, and superior over-all administrative record combined with outstanding discipline and morale."

RE-EXAMINATION OF MEN REJECTED FOR CARDIOVASCULAR DEFECTS

About 10 percent of the first one million registrants rejected for all causes were disqualified because of cardiovascular diseases, according to an estimate by the Selective Service System. The subcommittee on cardiovascular diseases of the National Research Council in June 1942 proposed a plan to re-examine a large number already rejected for these causes. The proposal was approved by the Director of the Selective Service System, Major General Lewis B. Hershey, and was initiated with the help of the chief of the Medical Division, Colonel Leonard G. Rowntree. The work was done under a contract between the Office of Scientific Research and Development and the University of Pennsylvania and under the auspices of the National Headquarters, Selective Service System, Washington, D. C.

The re-examination was made in five cities, each with a large university medical center where a sufficient number of cardiologists would be available. Boston, Chicago, New York, Philadelphia, and San Francisco were designated for the study of 1,000 rejectees each. The state director of Selective Service in the states in which these cities are located appointed special medical advisory boards which rendered invaluable help.

The general plan of the re-examination was undertaken with four purposes in mind: (1) a more detailed analysis of problems of cardiovascular diagnosis and of the range of the normal heart was desired to point the way for further follow-up study and research; (2) to know the possible amount of salvage of men for military service in this particular field; (3) to compare the opinions of cardiovascular experts with those of examiners in the local boards and induction stations, as a pioneer research, to determine the feasibility of re-examinations in other special medical fields or in the same field in other parts of the country; (4) to make a brief inquiry as to the ability of men whose rejections were confirmed to carry on in civilian life.

Cardiovascular experts volunteered their services and junior medical volunteers were obtained to assist them. A uniformity of arrangements prevailed in the re-examinations. The examinations were carried on mainly in the recumbent position but often in the upright position too, for comparison, and by at least two examiners. If men were considered suitable for resubmission as 1A, they were checked by at least two of the senior examiners and were electrocardiographed and submitted to the x-ray department of the various hospitals for teleoroentgenograms before the decision to resubmit as 1A was finally made. In all the cities, frequent consultations among the examiners were held concerning individual cases and moot points of diagnosis.

The total number of rejectees re-examined was 5,127, of whom 133 were omitted for statistical purposes because they

were rejectable for other than cardiovascular reasons, leaving 4,994 for the complete statistical study. The great majority of these men were white and of various nationalities; many of them, however, were from other races. The majority were from the cities, living in or close to the five metropolitan areas noted.

The combined report¹ of this work and the individual reports² by the chairmen of the special medical advisory boards have been published. The summary and conclusions of the combined report were in large part, as follows:

Of the total number of 4,994 cardiovascular rejectees examined, there were 863 (17.3 percent) resubmitted as 1A and 4,131 (82.7 percent) whose rejection as 4F was confirmed.

The percentages of men resubmitted as 1A were quite similar in Boston (18.8 percent), New York (19.2 percent), and Philadelphia (16.5 percent). In San Francisco 28.6 percent were resubmitted. Chicago yielded the lowest salvage (3.88 percent), apparently because cardiovascular experts had already been freely used in the decision about doubtful cases, a procedure which might profitably be followed by other examining groups throughout the country.

The chief cause for rejection was rheumatic heart disease, found in 2,476 men, or 50 percent of the total 4,994, and in 59.9 percent of the final 4F group. Mitral valvular disease without aortic valvular disease was diagnosed in the majority of these rheumatic heart cases, 1,500 or 60.6 percent (750 with obvious stenosis); aortic valvular disease without apparent mitral valve involvement in 280, or 11.3 percent (72 aortic stenosis and 208 aortic regurgitation alone); and mitral and aortic valvular disease combined in the remaining 628, or 25.4 percent. Auricular fibrillation complicating mitral stenosis was found in 24 of the cases. The incidence of rheumatic heart disease varied from 70.3 percent of the rejectees in Chicago to 39.6 percent in San Francisco.

The second most common cause for final rejection was hypertension, found in 1,059 cases (25.6 percent of the 4F cases and 21 percent of the total series). The majority showed elevation of both systolic and diastolic levels; a few had either systolic hypertension alone or diastolic hypertension alone. The incidence varied little from city to city but was relatively more common in the fourth than in the third decade.

Third in frequency as a cause of rejection was neurocirculatory asthenia with 204 cases (4.0 percent of the total series, or 4.9 percent of those finally labeled 4F). Negroes were rarely affected. The incidence varied from 78 (8 percent) in Boston to 11 (1.1 percent) in Chicago.

1. Levy, R. L., Stroud, W. D., and White, P. D.: Report of Re-examination of 4,994 Men Disqualified for General Military Service, J.A.M.A., 123:937-944, 11 Dec. 1943, and 123:1029-1035, 18 Dec. 1943.

2. Levy, R. L., Stroud, W. D., and White, P. D.: Re-examination of 4,994 Men Rejected for General Military Service Because of the Diagnosis of Cardiovascular Defects, Am. Heart J., 27:435-501, April 1944.

The fourth condition responsible for rejection of more than 100 men was sinus tachycardia; there were 189 cases, or 3.8 percent of the entire group and 4.6 percent of the final 4F cases. The numbers varied from 75 in Chicago to 8 in Philadelphia.

The fifth most common cause for rejection was congenital heart disease, found in 183 cases (4.4 percent of the 4F cases). The abnormality most commonly diagnosed was ventricular septal defect (Roger's disease) in more than a third of all the cases, 73. Five other defects, in the order of their frequency, were patency of the ductus arteriosus (29 cases), pulmonary stenosis (13 cases and 2 more with the tetralogy of Fallot), coarctation of the aorta (14 cases), auricular septal defect (6 cases), and subaortic stenosis (5 cases). The city incidence varied from over 6 percent (63 cases) in San Francisco to 1.8 percent (18 cases) in Philadelphia.

Other causes for rejection included cardiac enlargement alone, determined by x-ray examination (76 cases), arrhythmia in 32 including 17 cases of paroxysmal tachycardia, 6 of uncomplicated auricular fibrillation, 2 of auricular flutter, and 5 of auriculoventricular block; electrocardiographic abnormalities alone in another 32 cases including 10 with bundle branch block; cardiovascular syphilis in only 17 cases; thyrotoxicosis in 14; recent rheumatic fever in 13, cardiac strain from chest deformities in 10, coronary heart disease in only 6, pericarditis in 4, and peripheral vascular defects in 3. Unspecified heart disease was diagnosed in 113 cases.

Although the majority re-examined were white men, something under 10 percent of 4,035 examined in four of the cities were Negroes and a few were Chinese and Filipinos. A high rejection rate prevailed for Negroes (88 percent) and a very high rejection rate for the Chinese and Filipinos (100 percent) in the four cities in which racial data were available. Nine of the fifteen cases of aortic syphilis found in those cities were among Negroes. Hypertension was also more often found in the Negroes (38.5 percent of the final 4F cases compared to 23.1 percent for the white men). Rheumatic heart disease was evenly represented (63.8 percent compared to 63.9 percent), but neurocirculatory asthenia was very much less in the Negroes (0.9 percent compared to 5.5 percent).

Eight problems of particular interest remained unsolved and should be the focus of follow-up study but concerning which tentative opinions were expressed: (1) the interpretation of apical systolic murmurs (may they, if very slight or even slight, in the absence of any other abnormal or doubtful finding, be considered inadequate reason for rejection?); (2) the upper limits of the normal blood pressure (may the systolic pressure in very nervous young men be set perhaps as high as 160 mm. of mercury or even a shade more, provided the diastolic pressure does not exceed 90 mm.?); (3) the

limits of the normal pulse rate at rest (may there not be a wider range, say from 40 to 120 per minute, than that actually given in the current criteria?); (4) the heart size, which also varies widely, especially according to body build, and may perhaps in a few normal individuals exceed the standards set by Hodges and Eyster; (5) the electrocardiogram, of which the wide range of normal has not yet been explored adequately; (6) neurocirculatory asthenia, difficult to diagnose in mild degree, but probably rejectable even when slight, unless there is an obvious cause which can be corrected; (7) recent rheumatic fever, a hazard even when the heart seems normal; and (8) exercise tests, the usefulness of which in cardiovascular examination for military service is open to question.

A follow-up study of the men reclassified as 1A, especially the doubtful "borderline" cases in the final 4F group, should in years to come aid in solving some of the various problems in cardiovascular diagnosis that still remain.

LEGION OF MERIT

The War Department has announced the award of the Legion of Merit to the following Medical Department personnel:

COLONEL FRANK B. WAKEMAN, M.C., posthumous: For services from July 1940 to March 1944. With rare foresight, initiative, and organizing ability he laid the groundwork for the necessary expansion in all phases of Medical Department training, placing in operation replacement training centers, service schools for officers, Medical Department enlisted technicians' schools, and an officer candidate school, long before the entry of the United States into the war. As a result of his insight into medical requirements and the execution of plans, the Medical Department was able to expand greatly its training activities following 7 December 1941, and also, because of training already given, to render an efficient medical service to the Army during the very rapid expansion that followed the declaration of war. His unusual foresight, aggressive execution of approved plans, and selfless devotion to the best interests of the Army and the Medical Department are in the highest traditions of the service.

COLONEL CLIFFORD V. MORGAN, M.C., of Washington, D.C.: For services in the Office of the Under Secretary of War from September 1940 to March 1942. As Chief of the Commodities Division, Resources Branch, and its representative on the Army and Navy Munitions Board, he was charged with the responsibility of determining the needs of the armed services and of essential industries for strategic, critical, and essential materials required for the vastly expanded production program and, according to the degree of their scarcity, to initiate measures designed to ensure their proper and most efficient allocation. As the emergency became more acute he, because of his comprehensive grasp of the entire munitions problem, his executive ability, powers of perception and analysis, and his great tact in securing adjustments with authorized representatives of industry, contributed materially to ensuring supplies of the vitally needed materials without which the expanded war production program could not have been accomplished.

AWARD OF THE BRONZE STAR MEDAL

The War Department has announced the award of the Bronze Star Medal to the following Medical Department personnel:

LIEUT. COLONEL WILLIS B. JOHNSON, M.C., of Everett, Washington: From 30 July to 28 August 1943, at New Georgia, British Solomon Islands, he was in command of a medical battalion which moved from Guadalcanal into close support positions on New Georgia under enemy air and ground attacks. The effective evacuation and field treatment of casualties under the most trying conditions of terrain and weather during this operation were largely due to his determination and high professional and military knowledge.

LIEUT. COLONEL ROGER O. EGEBERG, M.C., of South Euclid, Ohio: With untiring efforts and with the highest devotion to duty, he trained the troops in the Milne Bay, New Guinea area, from 28 October 1942 to 31 January 1943, in mosquito control and discipline and reduced the malarial rate in a highly malarious area. More troops were thus made available for the services at a time when they were so urgently needed.

MAJOR HENRY T. EARHART, M.C., of Mulberry, Indiana: At Hollandia, Dutch New Guinea, from 26 April to 18 May 1944, he was outstanding in performance of duty in a place of great responsibility as surgeon of a signal battalion. By his conspicuous efficiency above and beyond the regular call of duty he rendered invaluable service in the handling of the sick, injured, and wounded men from a command of over 600 men, with a very limited number of Medical Department personnel.

CAPTAIN ROY E. HANFORD, M.C., of Sandpoint, Idaho: During an intense enemy artillery barrage on 6 April 1944, near Anzio, Italy, a detachment tent of a hospital was struck by an enemy shell. With other medical officers who were on duty with him at an adjacent hospital, he rushed to the scene of the shelling and administered treatment to the wounded soldiers. Although the area was under continual bombardment, they remained at the perilous task of rendering medical aid and expediting the quick removal of casualties for additional treatment. Their heroic performance reflects the finest traditions of the Medical Corps.

CAPTAIN ISBIN S. GIDDENS, M.C., of Ray City, Georgia: On 29 July 1943, at New Georgia Island, Solomon Islands, he demonstrated an untiring devotion to duty, high personal courage, and a marked degree of professional skill when, by prompt action and efficient surgery, he saved the life of a soldier who was seriously wounded. He traversed 400 yards of terrain covered by hostile fire to reach the stricken man and, working in a slit trench during a heavy rain, performed a most difficult suture of the jugular vein. Because the soldier was too weak to move, Captain Giddens remained with him throughout the night, evacuating him the following morning.

CAPTAIN MAURICE STAMLER, M.C., of Beardstown, Illinois: On 26 October 1943, in Italy, he moved through an enemy artillery concentration which was falling at the rate of eight rounds per minute to the aid of three seriously wounded infantrymen who had been struck by fragments of an enemy shell. Arriving before his ambulance, he worked forty-five minutes, with enemy shells bursting within 50 yards of him, administering aid to wounded men. On arrival of the ambulance after the enemy artillery fire had ceased, he directed their evacuation. His utter disregard for personal safety in this gallant action is deserving of the highest praise.

RECENT DIRECTIVES AND PUBLICATIONS

This list is intended as only a brief reference to the items mentioned. Before acting on any of them, the original communication should be read. Request for copies, when made, should be directed to the source of communication through proper channels.

WD Circular No. 383

22 Sept. 44

Sect. V

Invention. All suggestions for inventions or devices received or on hand in any W.D. agency will be forwarded without action to A.G., who will transmit them to National Inventors' Council. The Council will dispose of those not warranting study by W.D. Those worthy of detailed study will be sent by Council to A.G. for reference to appropriate W.D. agency, which will render a report and recommendation. Suspends AR 850-50 insofar as it conflicts with foregoing. Rescinds sect. I, W.D. Cir. No. 248, 1942.

WD Circular No. 383

22 Sept. 44

Sect. VI

Laundry. Extends to A.S.T.P. students benefits of laundry services available to enlisted personnel served by Government-owned laundries operating under provisions of AR 80-2135.

WD Circular No. 385

25 Sept. 44

Sect. I

Income Tax. Bureau of Internal Revenue has ruled that, under sect. 251 of the Internal Revenue Code, compensation received by personnel of U. S. Army for service while serving in a possession of U. S. is compensation and derived from a source within a possession of U. S. and hence exempt under certain circumstances. Pay may be transmitted by disbursing officer direct to bank in U. S. and does not become income received in U. S. "Possession" does not include Territories of Hawaii and Alaska, Virgin Islands, or leased bases.

AR 600-20

C 8

25 Sept. 44

Command. Delegates authority to specified commanders to designate without regard to seniority the junior of several officers of the same grade within a command as commander thereof. Provides that such authority will not be used to assign command functions to Medical Dept. officers when such assignment involves troops other than those of Medical Dept.

GAO Daily Synopses of Decisions

14 Nov. 44

B-45088

Student Nurses. Under act of 4 March 1944, providing travel expenses for student nurses traveling to Federal hospitals and return, only travel necessary in going from a private institution to a Federal hospital and return is authorized at Government expense. Student nurses may not be furnished transportation in kind to a place selected for personal reasons, regardless of distance involved.

ASF, Headquarters

Circular No. 375

14 Nov. 44

Part Three, Sect. III

General Hospitals. Effective with the disposition of patients during November 1944, general hospitals giving final definitive treatment to sick and wounded Army personnel will enter on W.D., A.G.O. Form 8-24 (formerly W.D., M.D. Form 52) the type of specialized treatment given each patient as established by The Surgeon General in current directives. Medical patients who do not require treatment within the province of a designated medical specialty will be classed as "general medicine." Surgical patients who do not require treatment within the province of a designated surgical specialty will be classed as "general surgery."

Correspondence

MESSAGE FROM THE CHIEF SURGEON IN THE FAR EAST

The following is an extract from a Malaria News Letter published in the Southwest Pacific Theater, 25 December 1944.

The reduction of the malaria attack rate in this theater to a point at which it no longer constitutes a dangerous handicap to our military effort is an achievement of historical importance in preventive medicine. It has been the result of a joint effort which is to the great credit of all who have participated.

In this accomplishment the malariologists and the malaria survey and malaria control units have played the major role. Despite hardships and often danger, their achievements have been notable.

The Medical Department is proud of your initiative and perseverance, of your professional contributions, and of the striking success of your efforts.

As Chief Surgeon I express my deep appreciation of your past services and my confidence in your ability to meet the new tasks that lie ahead.

GUY B. DENIT,
Brigadier General, United States Army,
Chief Surgeon.

General Denit, a native of Virginia, has been in the Army Medical Corps since 1918. He was for two years instructor, Command and General Staff School; then surgeon, Third Army and Eighth Army Corps, and surgeon, S.O.S., Task Force A, in 1942; chief surgeon, Atlantic Base Section, Casablanca, Morocco, December 1942 to July 1943; assistant commandant, Medical Field Service School, Carlisle Barracks, Pa., and since January 1944, Surgeon, Southwest Pacific Area.



Brigadier General Guy B. Denit.

ORAL PENICILLIN

The following letter, dated 16 October 1944, was forwarded by Captain Leon F. Moldavsky, M.C., penicillin officer, and Captain William D. Hesselbrock, Sn.C., bacteriologist, from the Harmon General Hospital, Longview, Texas.

We have found that prolonged and effective concentration of penicillin in the blood occurs when oral administration by the method which is herewith described is utilized.

An ordinary gelatin capsule is packed with 100,000 units of penicillin powder in a room kept at 10° F. By filling the capsule at this temperature, the hygroscopic quality of the powder becomes neutralized so that the formation of a gummy mass which rapidly deteriorates is prevented. After the capsule is filled with the powder and sealed tightly, it is taken to room temperature and a transparently thin uniform coating of salol is applied. The enteric capsule thereby produced passes through the stomach unchanged into the small intestine, where absorption occurs. Thus, the well-known destructive effect of the hydrochloric acid in the gastric juice is eliminated.

Single doses (that is, one capsule containing 100,000 units) were given to patients, from whom food and water were withheld for the purpose of establishing constant experimental conditions. Blood was drawn first at fifteen-minute then at half-hour intervals, and penicillin concentrations were determined. The blood levels of penicillin were measured in Oxford units per cubic centimeter. With the employment of this method, 75 percent of the cases were positive. Concentration of penicillin in the blood rose to levels up to 0.75 units within the first one-half hour after administration, maintained itself at concentrations of 0.25 units per cubic centimeter two hours later, and was present even at the end of the third hour at blood values up to 0.09 units per cubic centimeter.

In all the patients so treated there were no ill effects. There were no signs of intestinal irritation, and the urines obtained showed the usual penicillin excretion but were otherwise negative.

The concept of oral use of penicillin with its obvious advantages of easy, painless administration, is not new. Abraham and his associates (Lancet, 2:177-188, 16 Aug. 1941) declared it ineffective when so given because of the rapid destruction by the hydrochloric acid of the stomach. Powell and Jamieson (J. Ind. M. Ass., 35:361-362, July 1942) using mice injected intraperitoneally with *Staphylococcus aureus* found that penicillin was effective on oral administration when given in conjunction with sodium bicarbonate. Florey and Florey (Lancet, 1:387-397, 27 March 1943) using capsules coated with cellulose acetate phthalate containing only 10,000 to 20,000 units of penicillin obtained satisfactory results but apparently discarded it in favor of the intramuscular route. In spite of these attempts, the oral route until now has apparently, without further experimentation, been discarded in favor of the intramuscular and intravenous routes.

It has become increasingly evident that penicillin must be given in large doses no matter what the means in order that adequate blood levels obtain. The use of 50,000 units of the drug intramuscularly has not produced levels higher than one unit in our own experiments and in the data published by Herrell

(J.A.M.A., 125:1003-1010, 12 Aug. 1944). Actually we have found that often even with this large dose intramuscularly levels no higher than 0.5 of a unit and less occurred with rapid fall and disappearance from the blood stream. The use of constant intravenous drip (Herrell) produces a blood level of only 0.24 units per cubic centimeter and carries with it the admitted hazard of venous irritation.

Previous failures to obtain suitable blood levels via the oral route of administration are probably due to the use of insufficient dosage, ineffective solutions, and improperly prepared capsules.

Experimentation improving the technique of capsule preparation, determining blood levels possible with repeated capsule administration and resultant clinical effects, is now in progress.

LETTER FROM A SURGICAL CONSULTANT

Extract from a letter from the surgical consultant in a foreign theater to the Chief Consultant in Surgery in The Surgeon General's Office.

Since writing you I have been up to Leyte, going by hospital ship. On reaching the harbor we were asked to pull over to a Liberty ship which had just been hit by a Jap plane diving into her hold. The dead and injured were mainly Army personnel who had not disembarked. The wounded were transferred to a hospital ship together with others from LST 464. The latter craft has been converted by the Navy into a harbor hospital ship. Her tank deck has built-in hospital bunks, an operating room, and treatment rooms. In addition, she is the blood bank for an amphibious force.

I transferred to this LST in order to land on one of the beaches. No sooner had we pulled away from the hospital ship when the alert sounded and a heavy raid on shipping in the harbor occurred. Of eight Jap planes seen to dive on ships, five crashed into them deliberately and three missed their target and crashed into the sea. The pilots carried their bombs into the ship. Some of the Jap pilots found on the decks are said to have worn ceremonial burial robes. LST 464 stuck with the Libertys throughout the action, going over to those hit and on fire and taking off the wounded. A few of us Army doctors who were passengers helped the Navy medical officers operate for a good part of that night. This sort of work has been routine for 464 ever since D-day.

A ship equipped as a hospital, such as LST 464, which will remain permanently in the harbor is certainly indicated in these operations. The LST's and APA's with surgical teams aboard answer the problem for D-day and D-day plus one and two, but after emptying their cargoes they pull out and their surgical teams are no longer available. Even after hospitals ashore are set up, the distances are great and transportation very scarce so the harbor casualties are best treated in the harbor.

The wounded coming back by Navy LST's and APA's and by the Army-manned hospital ships reached the bases in the best condition seen thus far in any of our landings. We have been pushing more skilled surgical personnel further forward steadily by strengthening the staffs of the field, evacuation, and portable surgical hospitals, and by the use of hospital teams. Naturally

there are instances of questionable judgment, and these are immediately pointed out and discussed. The record of the hospitals on the whole, however, has been excellent. Visits to new units and discussion of surgical principles, as applied to conditions here, have borne fruit.

We have managed thus far to supply whole blood in sufficient quantities, but the plan to fly it from San Francisco would be a great help. Resupply to isolated areas before air transit is available is a problem.

Penicillin has been plentifully supplied from the United States. Can you give us your advice on the administration of penicillin by continuous intramuscular drip?



U. S. ambulances ford river while Army engineers build bridge to replace one destroyed at Pont Hébert, France, by retreating Germans. 8 August 1944. Signal Corps photograph.



Yanks from Coast Guard-manned LST examine medical supplies abandoned by Japs when retreating before American offensive on Biak Island close off New Guinea. Coast Guard photograph.

Original Articles

Fractures in Battle Casualties

CAPTAIN JOSEPH T. COYLE

Medical Corps, Army of the United States
and

MAJOR WESLEY D. THOMPSON, JR.

Medical Corps, Army of the United States

This report is based on the work of the fracture service of a station hospital for the sixteen weeks ending 1 November 1943, a period including the entire Sicilian Campaign and about the first six weeks of the Italian Campaign. Two thousand three hundred sixty-six patients were admitted to the surgical service during this period, of whom 967 were battle casualties; 1,170 patients were disposed of by evacuation, and 903 were returned to duty. The mortality rate was 0.3 per cent. Six hundred twenty-six fractures were encountered, of which 493 were compound and 133 simple. The fractures were distributed among twenty-two different bones.

WOUNDS ACCOMPANYING COMPOUND FRACTURES

The first patients from the Sicilian Campaign received on 12 July had received more than first aid, but in many wounds the débridement was incomplete. Fortunately, the wounds were not extensive nor were they grossly infected. These wounds were further débrided, sprinkled with sulfanilamide crystals, and petrolatum gauze was laid in the depths. The patients who arrived after 13 July had received excellent forward care, and seldom was further surgery necessary. Practically all these wounds had been inflicted by rifle, pistol, or light machine-gun fire. They were most frequent in the upper extremities and shoulders.

The above picture was a decided contrast to that presented by the wounds of the first patients received from the Italian Campaign, which, on the whole, were extensive, many grossly infected, and most of them had been produced by 88-mm. shell fragments. The patients arrived seventy-two to eighty-six hours after having been wounded, having previously received only a first-aid dressing on the beach.

Priority was given to wounds in which drainage was inadequate and to those associated with a definite elevation of temperature. The next wounds treated were those with extensive destruction of tissue with no, or slight, elevation of temperature. The surgical procedure in both groups consisted of excision of necrotic tissue with adequate incisions of the skin and fascia to give proper drainage. All patients with

compound fracture had secondary anemia, most marked in the group received from Salerno. Several cases had small, apparently clean wounds of entry and exit, but on closer examination, large pockets of pus and necrotic tissue were found about the shattered bone. An amazingly large amount of tissue had to be excised before healthy, bleeding muscles were encountered, while the nerves and blood vessels were apparently unaffected.

The after-care of perforating wounds and of deep penetrating wounds presented problems. The greatest degree of trauma of soft tissue was near the fractured bone, leaving relatively undamaged muscle and skin at the periphery. These wounds had a great tendency to seal rapidly; through-and-through drainage was dangerous because of the proximity of large vessels and nerves; the wounds could not be packed, for that would plug the drainage; the use of petrolatum strips alone did not give adequate drainage regardless of how they were inserted. Therefore, frequent dressing and changing of casts were necessary. In one case large rubber tubes were inserted through the skin and underlying normal muscle in conjunction with the petrolatum strips to provide better drainage.

As soon as the beachheads were firmly established in Italy, the patients arrived with more completely débrided wounds and fewer infections; however, the perforating and deep penetrating wounds of the calf and thigh were sometimes not treated radically enough. The wounds of entry and exit are so small that it is very tempting to débride only superficially, not realizing the added amount of damage to the deep soft tissue produced by the bone at the time it was struck by the missile.

FOREIGN BODIES

One hundred sixty-one foreign bodies were found in these compound fractures by x-ray examinations, and forty-four were removed at operation. Many patients had had foreign bodies removed in forward areas. Our policy was to operate to remove a foreign body only if there was definite evidence that it was, or probably would be, a source of delay in recovery. Except for a few cases, therefore, the foreign bodies were not removed unless they appeared or were easily accessible during the débridement of the wound. In a few instances foreign bodies were buried in bony substances in association with incomplete fractures. These were left alone, and in not one case has a sinus formed.

NERVE INVOLVEMENT

The infrequency of injuries of peripheral nerves was striking, in view of the extensive damage suffered by other adjacent soft tissues. Among 626 fractures, only 18 patients were found to have nerve injuries, the distribution of which is shown in the chart. More patients suffered loss of function of an extremity from damage to muscles than from injury to nerves.

HEMORRHAGE

Several secondary hemorrhages have occurred ten to fourteen days after injury. We did not encounter one secondary hemorrhage during the Sicilian Campaign because the wounds were not as extensive and, probably, because patients were rarely kept long enough for secondary hemorrhage to occur. The hemorrhages have been of two types. The most common was from large muscle areas and occurred when the thin layer of necrotic material sloughed en masse. This type of hemorrhage has been controlled by thoroughly cleaning out the slough and applying hot, moist sponges. Petrolatum has been found unsatisfactory as a dressing in these cases; dry gauze fluffs, removed after forty-eight hours, have worked well. Four delayed hemorrhages from large wounds of the calf have occurred, due to the sloughing from the wall of either the posterior or the anterior tibial arteries. Hemorrhage was controlled by ligation of the involved artery. No circulatory disturbance was noted in any of these patients.

GAS GANGRENE

Gas gangrene was not encountered during the Sicilian Campaign. Three patients with compound fractures developed gas gangrene in September and three in October. They were treated in accordance with the theater policy as of that time. One patient succumbed to the infection.

POSITION OF FRACTURES ON ARRIVAL

The position of the fractures on admission ran fairly true to form, depending on the bone involved. Except for one case, the position of the fragments in fractures of the femur was routinely poor regardless of how the leg was immobilized. One patient having a compound fracture of the lower third of the femur was admitted with a large, infected wound. The femur had been plated with a four-screw plate, removal of which was necessary because the fragments were markedly bowed.

Fractures of the humerus, with few exceptions, were also in poor position, as were fractures of bones of the hands and feet. Fractures of the radius, ulna, tibia, and fibula were routinely in good position, even though in many instances there was considerable loss of bony substance. About half of the fractures of both bones of the forearm and leg arrived in satisfactory position. Of twenty-four simple fractures of the os calcis, many were complicated by fractures of other bones of the foot. The position of the majority of these fractures was poor on arrival and in only a few could the position be improved by manipulation.

IMMOBILIZATION

Twelve patients with fractured femurs arrived immobilized in Tobruk splints, all but one of which had to be changed because of pain or discomfort at the fracture site, in the region of the ischium, or in the heel. The only comfortable patient

had a simple fracture in the lower third of the femur. The remainder of the injuries were in the middle and upper thirds. Although our cases are too few to warrant conclusions, it appears that this splint is unsatisfactory for fractures of the middle and upper thirds of the femur. The remainder of the fractures of the femur arrived in body spica casts, and these patients traveled far more comfortably than those in the Tobruk splints. All of the spica casts, even the double spicas, were carried high on the chest. One of these casts on arrival was broken at the fracture site, and this patient was in pain. Another was broken at the hip and two had been ripped apart in the thoracic region, by the patients. One of these patients was irrational and the other tore the cast because of respiratory embarrassment. Not one of the last three patients was in pain. The short double-spica cast is apparently not being used in forward areas. We have applied a number of them and patients seem to be more comfortable than in the long variety.

Fractures of the hands and feet did not travel well in traction. All patients complained of pain and in several the part distal to the end of the cast was quite swollen. Traction maintained fair position in phalangeal fractures, but the position of metacarpal and metatarsal fragments was poor. Removal of the traction did not alter the position of the latter fractures, particularly the compound fractures.

Patients in Velpeau plaster casts traveled well, but position in the fractures of the humerus was poor. The patients with shoulder spica casts traveled equally comfortably and the fragments were in better alignment.

The remaining patients with fractures traveled well except those who were in faulty casts. Some casts were soft from soakage of blood and serum and some were loose or broken. In the former group, little could have been done to prevent the condition; however, in the latter group it appeared that both the split and the bivalved casts had been cut before the plaster had set. Bivalved casts arrived in the poorest condition and practically all had to be changed. Slipping of the fragments and bleb formations were occasional complications in both the bivalved and the split casts. Of the two, the split cast is the better. We have received a few unpadded, molded plaster casts, which were applied by the British while on board ship. All of these arrived in excellent condition and changing of these casts was not indicated in any case.

TREATMENT IN EXTENSION

Since practically all of the fractures of the femurs arrived with the fragments in poor position and alignment, treatment by means of skeletal traction was instituted in twenty-two cases. Kirschner wire or Steinmann pin, either through the region of the tibial tubercle or lower end of the femur, as indicated by the site of the fracture, was the method

used. The full-ring Thomas splint with Pierson's attachment was the form of immobilization employed in all but one case, in which, because of the fact that the Pierson's attachment was not available, a form of traction without splinting was instituted. Both direct suspension traction and indirect traction were used. Both forms proved to be successful, but we believe that the former is more comfortable and makes care of the patient easier.

All cases except three, in this series, have done well, length was obtained and maintained, angulation was corrected, and the wounds have progressed either to complete closure or are closing satisfactorily. We have been unsuccessful in correcting completely the posterior displacement of the distal fragment in two supracondylar fractures. In one fracture of the shaft we were unable to apply satisfactory cross-pull because of multiple injuries. Large wounds on the posterior surface of the thigh present a problem, in that dropping of the sling is necessary in performing the dressings. Undoubtedly this procedure encourages delayed union and a tendency to deformity.

In two cases we have maintained extension by hip spica casts. One, a supracondylar fracture, was so treated because of the extensive loss of soft tissue on the posterior aspect of the thigh. The second was a fracture of the intertrochanteric region and the base of the neck of the femur which required wide abduction. Both cases have done surprisingly well; in the former, the soft-tissue defect has filled in rapidly, and normal length of the femur has been maintained without deformity; in the latter, there is evidence of union in good position.

It has been necessary to treat only three fractures of the leg by skeletal traction. Two were simple: one, a fracture of both bones; the other, a trimalleolar fracture of the ankle. Both were placed in traction because of bleb formation. The fragments in the first case united satisfactorily. The second patient was "casted" and sent to the rear for definitive treatment. The third patient had a compound fracture of both bones, and a combination skeletal traction through the os calcis and cast was used for position. The wire was later removed and the fragments remained in good position. We have used skeletal traction in correction of three fractures of the neck of the humerus. Two are still in traction with the fragments in good position. Apposition could not be obtained in one because of interposition of the capsule. Satisfactory position was obtained by open reduction.

OPEN REDUCTION

Open reduction and internal fixation were performed on twenty-four selected simple fractures. The chart shows the distribution of the bones so treated. The indications for internal fixation in these cases were the same as in civilian prac-

tice. Interposition of soft parts, rotation or wedging of a large fragment, and failure to obtain correction by other means were the most common reasons for selection of open reduction. In two of these cases there were superficial wound infections which cleared up rapidly. No open reductions were performed in cases of compound fracture.

SKIN GRAFTS AND SECONDARY CLOSURES

Split thickness skin grafts have been performed over eleven compound fractures. The grafts were applied on wounds associated with compound fractures of the metacarpals (3), tibia (2), fibula (2), radius (1), ulna (1), internal condyle of the femur (1), and the metatarsals (1). These wounds averaged 9 cm. in length and 5.5 cm. in width. The largest wound was 15 by 11 cm., associated with a compound fracture of the tibia with considerable loss of bony substance. The operations were performed from the fourteenth to the fortieth day after injury, with an average of twenty-six days. The average percentage "take" of these grafts was 78. There was one complete failure. Bone was exposed in six of the cases; fortunately, several grafts took over bone on which the periosteum was intact. Bony spicules protruding through the graft were removed with rongeur forceps and the graft closed over the defect.

Secondary closures were done in seven wounds over compound fractures. These closures were performed on wounds associated with compound fractures of the scapula (2), greater trochanter of the femur (2), fibula (2), and metatarsals (1). The wounds averaged 8.6 cm. in length and 4 cm. in width, the largest being 16 by 8 cm. These operations were performed from the seventh to the twenty-first day after injury, with an average of sixteen days. Eighty percent of these closures were successful.

There seems to be a distinct advantage in covering large wounds associated with compound fractures as quickly as possible. The draining sinuses appear to heal more rapidly when the surrounding wound has healed following either secondary closure or skin grafting. It is certain that the early covering of bone prevents destruction of the periosteum and subsequent necrosis. The total number of hospital days will probably be greatly reduced; this is especially true in cases in which reconstructive surgery will be performed. On arrival in the United States these wounds will be healed, much of the soft-tissue defect filled in under the graft, and scar tissue will be at a minimum.

UNTREATED CASES

Some explanation should be given for the large number of untreated fractures. These patients arrived during the Sicilian Campaign, at which time this organization functioned largely as an evacuation hospital. One hundred seventy-nine frac-

ture cases were admitted in satisfactory casts. These patients were comfortable and did not have an elevation of temperature. It must not be inferred that all of these fractures were in good position, for they were not, nor that all of those in which the cast was changed were in bad position. Several reasons other than position made change of casts necessary. It was not uncommon for patients to be evacuated from the hospital within twenty-four to forty-eight hours after their arrival. Not until the first week of the Italian Campaign was definitive treatment authorized in extremity cases, and the work represented in this report, for the most part, has been done since that date.

Toxic Psychoses Following Atabrine

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and

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The increasing use of atabrine as an antimalarial agent makes it incumbent on medical officers to be familiar with the virtues of this very effective drug, and also with its limitations and untoward effects. This report concerns the toxic psychoses which occurred in patients with malaria who had been treated with atabrine. It is based on the first seven months' experience of this Army hospital in a highly endemic area to which 7,604 cases of malaria, including 35 individuals who developed a toxic psychosis, have been admitted. The incidence of this psychotic sequel to the malaria-atabrine insult is 0.4 percent in this series. During the same period, 197 acute psychoses not related to malaria or atabrine were treated, representing an incidence of 1.4 percent of the total medical admissions which numbered 14,045. Exclusive of the malaria admissions, this would represent an incidence of 3 percent for the acute psychoses.

The patients are of two groups: group A comprises American soldiers equally divided between whites and Negroes; group B comprises soldiers of an Allied nation. Group A, with few exceptions, has met malaria for the first time. Group B is composed of men who, generally speaking, have had one or more attacks of malaria in the past. The treatment of both groups of patients after admission for malaria was identical as regards the use of atabrine, conforming to S.G.O. Circular Letter No. 135, dated 21 October 1942.

Infection with *Plasmodium falciparum* occurred twice as frequently as did *vivax*. There were twice as many cases of toxic psychosis following *falciparum* as *vivax* malaria. Thus, the type of malarial parasite appeared to have no influence on the production of the psychosis. There were 3 white and 3 Negro American soldiers and 29 soldiers of an Allied nation.

The time of onset of the psychosis varied. The most rapidly developing case manifested itself on the third day of atabrine administration, after the ingestion of 0.9 gm. of the drug. The latest date of onset was twelve days after the last dose of atabrine was taken (a total of 2.1 gm.). The most common date of onset was the sixth day after completion of atabrine therapy, the usual dosage of the drug being 2.1 gm. Since the onset of the psychosis is often insidious, it is possible that more careful observation would have disclosed an earlier average date than the figured mentioned would indicate. None of these patients received excessive or even large doses of atabrine.

Two types of onset were observed, one characterized by an abrupt change in the patient's behavior with increased psychomotor activity, the other by a gradual onset with retardation and confusion increasing over several days. Patients of the latter group are potentially more dangerous; they not infrequently are discharged to duty before the psychosis has materialized, and some time may elapse before the abnormal behavior is recognized as such by unit authorities.

The symptomatology varied widely, apparently colored in part by the prepsychotic personality of the individual. Of the two main prototypes, the first was characterized by sudden increase in motor and psychomotor activity, frequently accompanied by auditory and visual hallucinations, delusions, and, in a few instances, by ideas of reference. To this was occasionally added disorientation. The affect was usually one of euphoria and expansiveness. The other type began more insidiously with gradual clouding of the sensorium, disorientation, and loss of recent memory. There was a tendency for these patients to fill in the amnesic blanks by confabulation. There was diminished activity in both the intellectual and motor spheres. These patients were withdrawn and seclusive, at times going to the extreme of catatonic negativism and mutism. The predominant affect was one of bewilderment and fearfulness.

Physical examination failed to disclose any significant findings. Only 3 patients had fever on admission and this disappeared within twenty-four hours. The laboratory data were uninformative. The leukocyte count varied from 4,400 to 11,600, the majority of the counts showing a normal or slightly leukopenic figure. An occasional patient, especially in group B, had mild secondary anemia. There were two positive blood Kahn reactions but both had negative spinal fluids. A false positive reaction was ruled out by repeated

Kahns, and since there was no evidence of secondary syphilis they were considered to be cases of latent syphilis. The icteric index varied from 6 to 10 units despite the atabrine discoloration occasionally seen. The blood of the three Negroes was studied for sickling, with negative results. At least three blood examinations for malarial parasites were made in each case. Two patients became reinfected or relapsed after recovering from their psychosis, both with positive malarial smears. They recovered from the infection without further incident under the usual routine antimalarial therapy.

TREATMENT

The treatment of these psychoses included the usual measures of sedation and restraint. Sedatives were discontinued as quickly as possible. In a few cases, when motor excitement approached the acute manic state, narcosis therapy was required. Effort was made to ensure adequate fluid intake and output. A high caloric, high vitamin diet together with large doses of vitamin B complex was given. Ferrous sulfate was administered in cases with anemia. The use of 50 percent glucose together with insulin and thiamin chloride intravenously was tried in a number of the earlier cases with no obvious effect.

One of the previously-mentioned patients who developed malaria again following recovery from his psychosis received the usual course of antimalarial atabrine therapy without untoward results and without reproducing any evidence of psychosis. The fact that this man failed to become psychotic during a second course of atabrine therapy for another attack of malaria emboldened us to carry out the experiments which constitute a part of this report.

The duration of these psychotic episodes can be predicted with some accuracy, since 33 of the 35 patients have recovered. One patient recovered in eight days and one in eighty-five days. The average duration of the psychosis for the recovered group was twenty-three days. The two patients still under treatment are Americans. The duration of their psychoses has been one hundred twenty and sixty-four days, respectively. These patients exhibit psychotic trends which are strongly suggestive of a schizophrenic reaction. While complete personality studies are not available on these men, the information obtained from their officers and friends indicated that both had been good workers, sociable, with none of the obvious traits suggestive of a schizoid personality. However, in view of the course of their psychosis, it seems unlikely that the malaria-atabrine insult was the sole factor initiating the psychosis. Failure to recover, together with the steady deterioration both intellectual and affective, makes it seem likely that in these instances a schizophrenic reaction has been precipitated. Their progress depends on the malignancy of the process.

The course of the psychosis, in the hospital, was noisily or quietly uneventful. Once the pattern of the psychosis had become established the picture remained fixed, aside from slight variations in the sensorium, until it suddenly began to clear. In most instances this quick return to normal was accomplished in from twenty-four to forty-eight hours.

Complications occurred in three cases: dislocation of a shoulder, cystitis, and spontaneous rupture of a spleen. The dislocation was incident to a convulsion which followed the sudden interruption of narcosis therapy. The cystitis resulted from repeated catheterization in an individual who was negativistic to the point of refusing to void. The ruptured spleen occurred three days after admission for the psychosis; the patient was operated on and recovered without incident.

DIAGNOSIS

In making a differential diagnosis, the most important condition to be ruled out in an area such as ours is cerebral malaria. It is axiomatic here that any peculiar mental reaction, whether febrile or not, is regarded as cerebral malaria until proved otherwise. Malarial smears must be done immediately and repeatedly on all such patients, together with leukocyte counts and other appropriate tests. The temperature chart must be carefully watched. The slight initial fever, present in a few, subsided within twelve to twenty-four hours. The fact that all of these patients had recently completed a routine course of antimalarial therapy helped to arouse the suspicion of toxic psychosis rather than a relapse or reinfection with malaria. Additional points that proved useful were: The symptoms were exclusively psychiatric; the abnormal behavior pattern remained more or less constant until recovery; there were no objective neurologic disturbances.

Once the diagnosis of psychosis is made, it becomes necessary to differentiate it as to etiology and type. The possibility of functional psychosis must always be considered, since these toxic psychoses may mimic more or less completely the acute catatonic psychoses which are so common in the Army. The ruling out of a functional psychosis was partially aided by a study of the prepsychotic personalities of these patients. The officers and enlisted men who were friends of the American soldiers were questioned, but in no instance was there elicited a history of unusual personality deviations indicative of a dormant psychosis. The four recovered Americans gave no evidence of any psychiatric abnormality despite careful study. Personality studies were not readily obtainable in the case of the Allied soldiers. However, these men had been in their army from two to seven years under combat conditions. During a period as long as this, combat should have eliminated most of the psychiatrically unstable individuals; moreover, the recovered cases have shown no abnormalities on being returned to duty.

The history of a recent attack of malaria and the more benign and limited course of the illness are suggestive differential points. The mental content is not particularly helpful, since many of the productions are similar to those in the personality and complex-determined psychoses. However, in this group disorientation, together with loss of recent memory, more frequently dominates the picture. The possibility always remains that these toxic psychoses may have no relationship to atabrine, merely being precipitated by the malaria-atabrine insult.

Speculation as to the mechanism by which atabrine may produce psychosis is probably futile. The fact that only a small percentage of individuals to whom atabrine is administered develops a psychosis suggests a type of sensitivity or a constitutional predisposition to psychotic behavior. If this latter supposition is true, then atabrine is at most a mere trigger mechanism which releases the psychotic trend previously determined psychobiologically. The benign course which most of the cases have followed to date would argue against the latter interpretation. However, only further follow-up of these patients can give the final answer to this problem. If the psychosis is a manifestation of drug sensitivity, it is not permanent. The sensitivity may be a complex affair depending in part on avitaminosis. While this factor was not obvious, it is by no means improbable that subclinical deficiencies may have existed. It is quite possible that the added demands made by malaria and its treatment on patients whose vitamin reserves had been reduced to a level of subclinical deficiency might eventuate in a pathologic syndrome which would fail to materialize in a background of good vitamin reserves.

RETESTING WITH ATABRINE

The fact that one patient who had recovered from a psychosis received a second course of atabrine because of malarial reinfection or relapse without reproduction of the psychosis seemed to justify testing others who had recovered from toxic psychosis with a second course of atabrine. Accordingly, 14 other recovered patients were selected for retesting under hospital observation. To each patient two tablets of atabrine (0.2 gm.) were administered every six hours for five doses followed by one tablet (0.1 gm.) three times daily for six days, making a total of 2.8 gm. of atabrine. Of the patients so treated, only one has exhibited untoward reactions. This patient became mildly excited on the last day the drug was administered, but this had completely disappeared in forty-eight hours. The other patients remained perfectly well both physically and psychologically throughout the test period and for ten days thereafter, when they were released to duty. One other patient of this retest series developed a second attack of malaria just before atabrine was started. He, too, went through

the infection and the atabrine regimen without exhibiting any recurrence of the psychosis.

In all, therefore, 16 patients recovered from a toxic psychosis following atabrine were retreated with atabrine. Of these, 15 exhibited no untoward symptoms and have remained well. Furthermore, 2 of these had not only atabrine but malaria as well and suffered no relapse into their psychosis. One patient became mildly excited for twenty-four hours on the last day of treatment.

Consideration of these data leads to the following alternative hypotheses: There is no specific causal relationship between atabrine and these psychoses; these toxic psychoses represent an unusual sensitivity reaction to atabrine in which at least temporary desensitization is produced by the initial attack; or this psychosis is a complex-conditioned sensitivity in which atabrine is one of several factors which must coincide in a given individual in order to produce this syndrome.

We have stated reasons for believing that atabrine plays a role in producing these psychoses. The hypothesis of temporary desensitization to atabrine as a result of an acute attack is compatible with our findings. At present we are unable to state the duration of this hypothetical period of desensitization. The retested cases presented intervals of from sixteen to two hundred and ten days between the onset of the original psychosis and the readministration of atabrine. We may say, therefore, that sixteen to two hundred and ten days represents a nonreactive period during which atabrine causes no trouble. We hope to test a few of these patients again after a much longer interval, at which time it is possible we may find them highly sensitized and equally possible we may find them totally unreactive to atabrine.

Finally, the hypothesis of a complex conditioning to atabrine sensitivity must remain entirely speculative for the present. Vitamin deficiency must be considered as a possibility. The concurrence of malaria and atabrine as a necessary cause of the psychosis is disproved in part by two of the retested cases who suffered this combination without recurrence of psychosis.

SUMMARY

Thirty-five cases of toxic psychosis following atabrine have been observed among 7,604 atabrine-treated cases of malaria in a period of seven months. The psychosis begins either during the course of atabrine therapy or shortly after its conclusion. There are two main types of onset. The most frequent (65 percent) is marked by excitement, hallucinations, and delusions. The other (35 percent) begins with retardation, disorientation, and amnesia for recent events, together with confabulation. No constant physical or laboratory findings are present. Aside from supervision, sedation, restraint, and nursing care, no specific therapeutic measures have been found useful. The course of the psychosis has been

benign in most instances. Two of these patients developed a second attack of malaria and were retreated with atabrine within twenty to twenty-six days after the onset of the psychosis without reproducing a second psychotic episode. Fourteen additional patients, after recovery from this type of psychosis, making a total of 16 cases, were retested with atabrine, and only one case showed any untoward reaction. This was a mild excitement which cleared within twenty-four hours.

Whether these psychotic episodes represent a toxic reaction to atabrine or are merely toxic psychoses occurring as a result of the malaria-atabrine insult, with the possible additional factor of subclinical avitaminosis, cannot be stated definitely. There is no evidence to suggest that these men were psychiatrically unstable. It is our belief that atabrine is the etiological agent. We hypothesize an acute, possibly conditioned, sensitivity to atabrine in which the initial attack desensitizes the patient for at least several months. During this period atabrine may be readministered safely to these individuals. We are unable to state, however, that at a later date these patients may not again become sensitive to atabrine. Caution is therefore advised in the treatment with atabrine of malaria relapses or reinfections in patients who have had a toxic psychosis of this type.

The total incidence of such psychoses which complicate malarial cases treated with atabrine is extremely small (0.4 percent) and their course is relatively benign, since 33 of the 35 cases recovered without incident. The two unrecovered cases have developed typical schizophrenic reactions apparently precipitated by the malaria-atabrine episode. Their pre-psychotic personality gave no hint of a latent psychosis. The chief concern lies in the early recognition of the condition so that the patient may be adequately cared for during the psychotic period.

Liver Injury in Hemorrhagic Shock.—Studies recently conducted by Doctor C. N. H. Long and his associates indicate that in experimental hemorrhagic shock serious liver injury may occur. It has long been known that the nonprotein nitrogen content of the blood rises during shock. A tendency for a rise in the amino acid nitrogen fraction has also been demonstrated previously. Anoxia of the peripheral tissue causes an increased breakdown of protein and release of amino acids into the blood stream. In the experimental animals removal of these amino acids from the blood is the responsibility mainly of the liver. These studies show that the disturbed liver function was clearly related to anoxia of the liver. The ratio of blood urea nitrogen to total nonprotein nitrogen was inversely proportional to degree of liver injury. Another interesting feature of these studies was the contrasting effect of anoxia of hemorrhagic shock on the liver and kidneys, both of which may suffer severe injury. They show clearly that for comparable degrees of injury as manifested by disturbances of in-vitro respiration of tissue slices, kidney tissue had greater capacity for survival and recovery after severe injury due to anoxia than did liver tissue.

The Diarrhea Problem in a New Guinea Base

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This study is based on a hospital experience of 1,460 cases with common diarrhea, bacillary dysentery, and diarrheas due to other types of gram-negative bacilli (table I). Some cases were caused by a single organism while others were mixed infections. The majority of the patients were treated for diarrhea only, but in many, diarrhea was a complication of other conditions. Not all of the cases could be studied in detail because case records accompanied those patients who were transferred to other hospitals.

PREVENTION OF SPREAD IN THE HOSPITAL

Cases which had a recent history of diarrhea and those admitted for study of suspected bowel infection were isolated in special wards. Patients who developed diarrhea while in the hospital were immediately transferred to these wards. All such patients were given the following list of regulations, which were strictly enforced:

Don't Give Dysentery to Your Buddy!

1. Your stool is infectious to others.
 - a. Use the designated latrine *only*.
 - b. Keep the seat cover down. (Flies spread disease.)
 - c. Wash your hands in the antiseptic solution, then in water, after each bowel movement.
2. Your mess gear may be infectious.
 - a. The nurse will tell you when you are to go to the mess hall. You will be accompanied by a corpsman.
 - b. Rinse your mess gear in the chlorinated water near the mess hall before each meal.
 - c. Go directly from the mess line to the ward and eat your meal there.
 - d. The nurse will tell you when to clean your mess gear.
 - e. After eating, dump your garbage in the special can and then wash your mess gear in the nearby chlorinated water. After this, go through the regular mess kit line.
3. You may carry the disease.
 - a. There will be no visitors and you are not to visit other wards.
 - b. You may go to the movies but not to the Red Cross. Games will be found on your ward.

TABLE I

Types of diarrhea treated

Type	Number
Common diarrhea	967
<i>Shigella dysenteriae</i> and <i>paradysenteriae</i>	391
Paracolon group	60
Salmonella group	37
<i>Proteus morganii</i>	5
Total	1,460

Fly control was important in the prevention of diarrhea. Latrines and mess halls were tightly screened and latrines were oiled daily. Flies were eliminated in mess halls by means of fly-paper, fly spray, swatting, and many well-baited flytraps. A fly-trap was placed, also, on each latrine box. The ground around the mess halls was oiled daily. Garbage was kept in tightly covered cans and disposed of properly. During an outbreak of 520 cases of diarrhea, Page¹ was able to grow many colonies of *Shigella* organisms from the footprints of flies caught in army messes, living quarters, and latrines. This emphasizes the well-known axiom that the control of flies will control enteric infections.

Control of the water used for washing mess gear was strictly maintained. The officer of the day checked the temperature of the water with a thermometer three times daily while it was being used. A portable disinfecter (Med. Dept. Item No. 7791000) furnished steam to heat water for washing mess kits (figures 1, 2, 3, 4). This system had the advantage of cleanliness, dependable sterilization, and flexibility. The water in the drums was changed after 150 individuals had washed their mess kits. There was practically no delay when the change was made as the proper temperature (80° C. or over) could be obtained in about five minutes after the steam was turned on.

At regular intervals, all food handlers were physically examined and their stools cultured. Strict care was exercised in

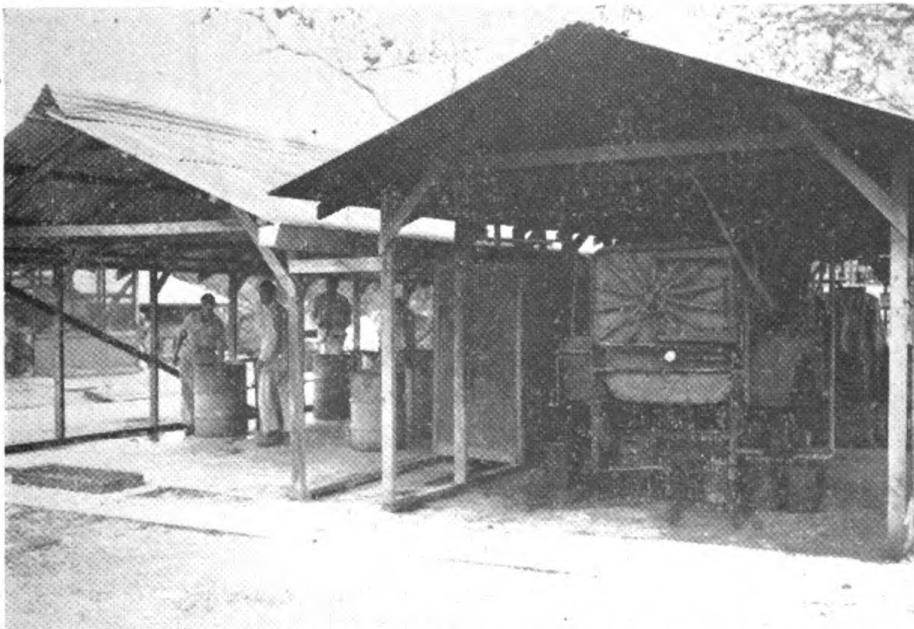


FIGURE 1. The 135th Medical Regiment designed and installed this mess kit washing apparatus. A portable field disinfecter created steam for heating water in the drums shown in the adjoining building.

1. Page, Sidney G., Jr.: Sulfaguanidine in the Treatment of Bacillary Dysentery, Bull. U. S. Army M. Dept., 72:50-62, Jan. 1944.

preparing all foods containing meat, milk, eggs, and mayonnaise. Signs were placed near unchlorinated water outlets warning patients not to drink or brush their teeth with the water.

The decrease in diarrhea admissions from the command of an Army hospital in New Guinea, during the third month of operation, when strict adherence to the above measures was instituted, is demonstrated in table II.

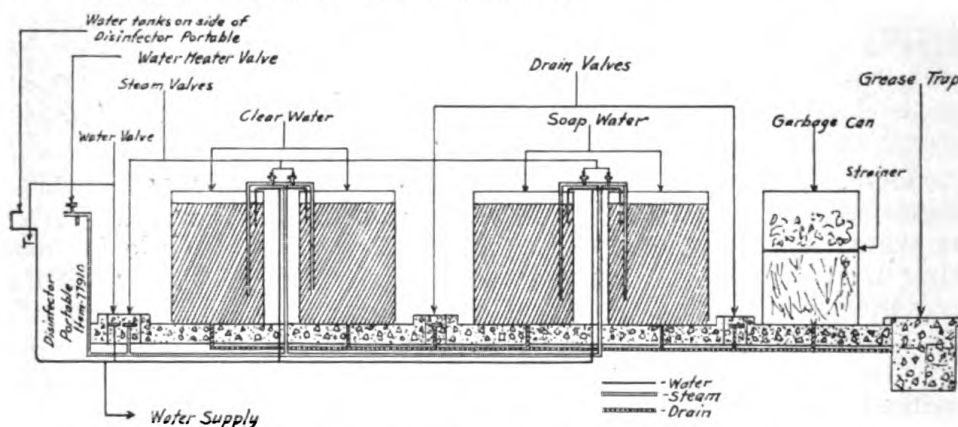


FIGURE 2. In the installation illustrated, the steam and water lines are laid beneath the floor which is concrete. Water is drained from the drums into a grease trap when the control valve is opened. Garbage is strained and the liquid from the garbage barrel flows into the grease trap.



FIGURE 3. Before the mess kit line starts, the officer of the day checks the temperature of the water. A temperature of 80° C. or over is maintained. Steam is visible rising from each drum.



FIGURE 4. Patients passing through mess kit line. Steam is rising out of drums, two of which contain soapy water and the others, clear water. The officer of the day determines that mess gear is properly washed and sterilized.

TABLE II
Duty personnel hospitalized for diarrhea

Month of operation	1st	2d	3d	4th	5th	6th	7th	8th	9th	10th
Common diarrhea	1	23	7	2	2	0	1	1	0	0
Shigella group	7	6	3	0	0	0	0	0	0	0
Paracolon group	0	0	0	0	1	0	0	0	0	0
Salmonella group	0	0	0	1	0	0	0	0	0	0

COLLECTING SPECIMENS FOR CULTURE

Shortly after the hospital started functioning, the direct swab method was instituted for collecting stool specimens. At 0800 o'clock each day, all patients who were to have stool cultures were sent to the isolation ward where the corpsman took the cultures. With the patient lying on his left side, the corpsman spread the buttocks apart with his left hand and inserted a sterile, empty, novocaine cartridge (obtained from the dental clinic) with his right hand. A sterile swab was then passed through the tube for a direct smear and the swab then returned to a sterile test tube and immediately sent to the laboratory. This method has advantages. It has been reported as giving the greatest number of positives. Cultures can be taken at any hour and do not depend on the time of defecation. All cultures are sent to the laboratory at the same time of day, simplifying the work of the technicians.

BACTERIOLOGIC STUDY

Stool cultures were taken on all patients admitted to the diarrhea wards. Those with pathogenic organisms were not discharged until two negative cultures were obtained. After release from the hospital, the soldier's unit surgeon was notified to take a stool culture at the end of one month. As far as known, no such follow-up cultures have been positive.

Practically all of the different varieties of *Shigella* organisms were present in the 244 patients whose records were available for study. The variety of organisms and percentages of the total are shown in table III. Of 208 cases of *Shigella* dysentery studied by Page,¹ 190 were of the Flexner type and 18 were Sonne. Adams and Atwood² found the following distribution: Flexner, 78.7 percent; Sonne, 10.2 percent, Newcastle type 8.9 percent and *alkalescens* 2.2 percent in 228 *Shigella* infections. In the same study they had 6 *Salmonella*, 19 Paracolon, and 14 mixed infections.

Using fever as a guide cases were classified according to severity. Those without fever were considered mild, those with three or fewer days of fever as moderately severe, and those with fever for more than three days, as severe. In table IV is shown the relative severity of the different infections due to gram-negative organisms. All of the mixed infections except one had *Shigella* organisms.

TABLE III

Infections by Shigella organisms

Variety	Number of cases	Percent
Flexner	173	70.9
<i>Sh. madampensis</i>	9	3.6
Boyd	4	1.6
<i>Sh. sp.</i> (Newcastle type)	11	4.6
<i>Sh. dysenteriae</i> (Shiga)	9	3.6
<i>Sh. ambigua</i>	25	10.0
<i>Sh. alkalescens</i>	6	2.4
<i>Sh. sonnei</i>	3	1.3
Unclassified	5	2.0
Total	244	100.0

TABLE IV

Severity of infections

Variety	Number of cases	Mild (percent)	Moderately severe (percent)	Severe (percent)
<i>Shigella</i> group	214	57	41	2
<i>Salmonella</i> group	21	57	38	5
Paracolon group	24	55	37	8
Mixed infections	31	40	57	3

More than half of the infections were classified as mild. The fact that a high percentage of Paracolon infections were severe is interesting. As would be expected, infections due to *Shigella dysenteriae* (Shiga) were severe in a high percentage of cases.

2. Adams, J. W., Jr., and Atwood, R. T.: Bacillary Dysentery, War Med., 5:14-20, Jan. 1944.

TREATMENT

The treatment of bacillary dysentery, until the end of the thirties, consisted essentially of one or more doses of a purgative, usually magnesium or sodium sulfate, and supportive measures. With the advent of the sulfonamides investigations were made to determine their effectiveness in the treatment of the dysenteries. Anderson et al.³ in 1941 treated 41 cases with sulfaguanidine for nine days and had no carriers, whereas 50 percent of untreated cases were carriers. Oppen and Hale⁴ rendered 90 percent negative with sulfaguanidine and found that 50 percent of nontreated controls remained positive. Brewer⁵ "cured" 73 percent of acute cases and 55 percent of chronic cases with sulfaguanidine. Bulmer and Priest⁶ treated 76 cases with sulfaguanidine and concluded that "sulfaguanidine is a specific against dysentery bacilli." They state⁷ that 323 patients treated with sulfaguanidine had their hospitalization time reduced to one-half that of 600 controls. Poth et al.⁸ used succinylsulfathiazole; Swyer,⁹ sulfa-pyridine; and Kuhns,¹⁰ sulfaguanidine and succinylsulfathiazole. Sulfaguanidine was used prophylactically by Lucchesi and Gildersleeve¹¹ in 45 children exposed to an epidemic at a school without any further cases developing. Scott¹² gave 0.5 gm. of sulfaguanidine three times daily to all children in a mental institution and stopped abruptly an outbreak of Sonne dysentery.

There was a lack of uniformity in dosage and administration of drugs used by different investigators. Bunting and Levan¹³ used a ten-day course of 3.5 gm. of sulfaguanidine given three times daily. Page¹ gave an initial dose of 7 gm. of sulfaguanidine followed by 3.5 gm. every four hours for two days, then 3.5 gm. every eight hours for eight days. If this course of treatment was unsuccessful, he then gave 2 gm. of sulfadiazine followed by 1 gm. every four hours for two days, then 1 gm. every eight hours for three days.

At first, in this station hospital, each ward officer used the type and dose of sulfonamide he desired; later the treatment became standardized. One group was treated with miscellaneous

3. Anderson, D. E. W., Cruickshank, R., and Walker, J.: Treatment of Bacillary (Flexner) Dysentery with Sulphanilylguanidine, *Brit. M. J.*, 2:497-501, 11 Oct. 1941.

4. Oppen, L., and Hale, V.: Sulfaguanidine in the Treatment of Dysentery (Bacterium Flexneri) Carriers, *J. A. M. A.*, 119:1489-1491, 29 Aug. 1942.

5. Brewer, A. E.: The Use of Sulphaguanidine in Bacillary Dysentery, *Brit. M. J.*, 1:36-40, 9 Jan. 1943.

6. Bulmer, E., and Priest, W. M.: Sulfaguanidine in the Treatment of Bacillary Dysentery, *J. R. Army M. Corps*, 79:277-286, Dec. 1942; correction, 80:226, April 1943.

7. Bulmer, E., and Priest, W. M.: Bacillary Dysentery; Chemotherapy in Its Treatment, *Lancet*, Lond., 2:69-71, 17 July 1943.

8. Poth, E. J., Chenoweth, B. M., Jr., and Knotts, F. L.: Preliminary Report on the Treatment of Bacillary Dysentery with Succinyl Sulfathiazole, *J. Lab. Clin. M.*, 28:162-167, Nov. 1942.

9. Swyer, R.: Sonne Dysentery; Sulphapyridine in Its Treatment, *Lancet*, Lond., 2:71-72, 17 July 1943.

10. Kuhns, D. M.: Control of Endemic and Epidemic Diarrhea, *South. M. J.*, 36:393-401, June 1943.

11. Lucchesi, P. F., and Gildersleeve, N.: Prophylactic Use of Sulfanilylguanidine in Dysentery Outbreak, *I. Pediat.*, 22:319-324, March 1943.

12. Scott, J. C.: Prophylactic Use of Sulfaguanidine, *J. A. M. A.*, 122:588-591, 26 June 1943.

13. Toxic Reactions of Sulfaguanidine Therapy, *Bull. U. S. Army M. Dept.*, 75:3-4, April 1944.

sulfonamides with no regularity as to type, dose of drug, or number of days of administration. A second group was treated with sulfaguanidine, 3½ gm. given every four hours for twenty-four hours, then 3.5 gm. three times daily for varying lengths of time.

A sulfaguanidine-sulfadiazine routine, which was given to a third group of cases, consisted of three courses. Sulfaguanidine, gm. 3.5, was given for six days in the first course following which two successive stool cultures were taken. The second course consisted of the administration of sulfaguanidine, gm. 3.5, and sulfadiazine, gm. 1.0, three times daily for six days following which cultures again were taken. In the third course, sulfaguanidine, gm. 3.5, and sulfadiazine, gm. 1.0, were used every four hours for six days and then the cultures were taken.

A fourth group of cases was treated by a sulfaguanidine-sulfathiazole routine as follows:

1st Course

- 1st Day —Sulfaguanidine, gm. 3.5, is administered every four hours and as soon as the stool culture is taken, sulfathiazole, gm. 1.0, is added with each dose of sulfaguanidine.
- 2d to 6th Day —Sulfaguanidine, gm. 3.5, and sulfathiazole, gm. 1.0, are administered three times daily.
- 7th Day —No medication is taken by the patient.
- 8th and 9th Day—Checkup cultures are obtained.

2d Course

In the interim, sulfaguanidine, gm. 3.5, is given three times daily until the previous culture reports are returned. If the checkup cultures following the first course are negative, the patient is released from the hospital. If the cultures are positive, treatment is continued as follows:

- 1st to 6th Day —Sulfaguanidine, gm. 3.5, and sulfathiazole, gm. 1.0, are given every four hours.
- 7th Day —No medication is taken by the patient.
- 8th and 9th Day—Checkup cultures are obtained.

When a patient vomited so much that he could not retain medication, he was immediately given 5 gm. of sodium sulfathiazole in 1,000 cc. of physiologic saline intravenously. Seldom was it necessary to give intravenous fluid a second time.

Although Bunting and Levan¹³ claimed to have 11.5 percent of reactions of all types with the use of sulfaguanidine, there have been no reactions in this series which interfered materially with the treatment of the patients. An alkali was given with all large doses of sulfonamides.

RESULTS

Adams and Atwood² used sulfaguanidine for three days in the treatment of 11 Newcastle infections with good results, whereas 9 untreated cases were positive after twelve days. Sixty of 89 untreated cases of Shiga dysentery cleared in an average of fourteen days. The 29 cases which did not become negative were successfully treated with sulfaguanidine. They used sulfathiazole and sulfaguanidine on another 89 patients with uniform success. They were unable to help 23 cases of Sonne infections with sulfaguanidine or sulfathiazole. Eisenoff and Goldstein¹⁴

14. Eisenoff, H. M., and Goldstein, H.: Control of an Outbreak of Bacillary Dysentery with Sulfonamides, J. A. M. A., 123:624-626, 6 Nov. 1943.

compared the effectiveness of sulfathiazole, sulfadiazine, sulfaguanidine, and succinylsulfathiazole in 83 cases of Sonne infections in an orphanage and concluded that these sulfonamides were of equal value.

Bulmer and Priest⁷ reported that 600 patients with "mild dysentery" stayed in the hospital for ten days whereas "true dysentery" cases were hospitalized an average of twenty days. Brewer⁵ treated 77 cases of bacillary dysentery with an average hospitalization of three to four weeks.

TABLE V
Treatment and results

Type	Miscellaneous sulfonamides	Sulfa- guanidine	Sulfa- guanidine and sulfa- diazine	Sulfa- guanidine and sulfa- thiazole
<i>Shigella infections</i>				
Number treated	18	113	73	31
Av. hospital days	30	14	15	12
Av. treatment days	17	8	8	6.3
<i>Salmonella infections</i>				
Number treated	3	12	3	3
Av. hospital days	29	22	14	16
Av. treatment days	20	12	12	9
<i>Paracolon infections</i>				
Number treated	1	11	0	12
Av. hospital days	40	12	0	11
Av. treatment days	22	7	0	6
<i>Mixed infections</i>				
Number treated	10	8	12	1
Av. hospital days	39	18	25	1
Av. treatment days	25	9	12	6
<i>Common diarrhea</i> (Uncomplicated)				
Number treated	0	361	0	152
Av. hospital days	0	7.2	0	5
Av. treatment days	0	—	0	—

Table V shows the results with the various forms of treatment in this hospital. In this series, all of the infections due to *Shigella* organisms were cured by the first course of the sulfaguanidine-sulfathiazole routine with the exception of 1 case which was subsequently cleared after the second course of therapy. There was a resultant decrease in duration of hospital stay and in the number of days of treatment. Infections with the *Salmonella* organisms were the most resistant to treatment and there was one failure with the first course of sulfaguanidine and sulfathiazole in this group. However, the stool cultures in this case were negative after the second course of therapy. Infections due to the *Paracolon* organisms responded well to treatment with sulfaguanidine alone and 12 cases treated with sulfaguanidine

and sulfathiazole responded to one course of therapy. Mixed infections have been more difficult to treat. One such case was cleared with the sulfaguanidine-sulfathiazole routine with the first course of therapy.

Seventy-one percent of those cases which had positive cultures for *Shigella* organisms and which were treated with sulfaguanidine alone were mild, whereas only 40 percent of those treated with sulfaguanidine and sulfathiazole were mild. Despite this fact, the latter group were successfully treated in fewer days. Except for this difference, the groups of infections were about of the same severity (table IV).

Seven hundred and nineteen patients with common diarrhea were treated with sulfonamides. Of these, 361 had no complicating diseases, were cured with the initial course of sulfaguanidine therapy, and required an average of seven and two-tenths days' hospitalization. Two hundred and forty-eight cases of common diarrhea have been treated with sulfaguanidine-sulfathiazole since this routine was instituted. Of these, 152 had no other diseases and they required an average of five days' hospitalization. Fifty-four percent of the latter group were hospitalized for four days or less.

In this entire series there was only one death. That patient had a fulminating infection due to the Shiga bacillus. Medication consisted of sulfaguanidine followed by sulfaguanidine and sulfadiazine during the six days preceding death.

CONCLUSIONS

Over 1,400 cases of diarrhea furnished the basis for this study. After trying many forms of sulfonamide treatments, a combination of sulfaguanidine and sulfathiazole was found to be the most effective. It reduced the hospitalization of uncomplicated common diarrhea from seven and two-tenth days to five days and cleared all but 4 percent of infections due to gram-negative bacilli with six days' therapy in 47 patients treated.



U. S. Army field hospital almost isolated by water due to heavy rain. The patients are being evacuated. 10 November 1944. France. Signal Corps photograph.

The Enlisted Man as a Psychiatric Aide

PRIVATE NATHAN HURVITZ

and

PRIVATE RALPH M. KRAMER

The Medical Department has been aware of the need for adequate services for soldiers presenting psychiatric problems and, in order to help deal with these men, military psychiatric social workers have been assigned to assist medical officers. Recognition of the need for military psychiatric social workers and the service which they could perform was announced in War Department Circular No. 295 of 13 July 1944. This circular stated:

In view of the extreme importance of the neuropsychiatric problem throughout the Army and because of the very limited number of neuropsychiatrists, full utilization at installations in continental United States should be made of trained psychiatric social workers, classified under Specification Serial Number (SSN) 263, TM 12-427, Military Occupational Classification of Enlisted Personnel. These individuals are highly trained technicians who can assist the neuropsychiatrist in interviewing, obtaining histories, procuring social data, counseling with individuals to be discharged, and arranging for their reception at home. Final disposition of this type of case can be materially assisted and hastened through proper utilization of these individuals. Psychiatric social workers are essential to the proper functioning of the consultation service in training centers, as assistants to neuropsychiatrists in the neuropsychiatric sections of hospitals and hospital annexes in the zone of interior.

The enlisted men who qualify for this SSN either "completed all courses and field work in a recognized school of social work, in a two-year major in social case work, or withdrew from such a program because of induction." The training of these men includes courses in the principles of mental hygiene, psychopathology, psychiatric aspects of social work, psychiatric nomenclature, use of psychological tests, assembly and analysis of case histories, social investigation, and use of community resources. In addition, they have had in-service training in the form of field work with family and children's case work agencies, psychiatric clinics, hospitals, courts, and penal institutions, and have had experience in cooperating with civilian social agencies. The Army has transferred these men to military assignments which use their specialized training. A study¹ by the American Association of Psychiatric Social Workers indicated that military psychiatric social workers are located as assistants to psychiatrists on NP wards, at consulta-

1. Rabinowitz, Clara, and Ross, Elizabeth H.: The Military Psychiatric Social Worker, The News-Letter, Summer 1944.

tion services, mental hygiene units, rehabilitation centers, and convalescent centers, where they are directly responsible to the medical officer in charge of their service. In these assignments, the work of the military psychiatric social worker consists principally of interviewing the soldiers referred for consultation and eliciting such information as the psychiatrist will need in making his diagnosis and disposition.

The fact that the military psychiatric social worker is also an enlisted man is of great importance and enhances his value to the psychiatrist. The military psychiatric social worker has had the same experience of training and lives the same life as the soldier patient. He is aware of the minutiae of the enlisted man's life and this helps in the establishment of a relationship with the soldier. In this relationship the soldier may talk with a sympathetic listener and be regarded as an individual, and he is thus given an opportunity to release significant feelings which he could not express in the ordinary routine of Army life.

The function of the military psychiatric social worker is to assist the psychiatrist to determine the military worth of the soldier, and he can make valuable contributions to the work of the psychiatrist because of his diagnostic skills. To this social worker, there is significance in the manner in which a soldier enters the interviewing room, his opening remarks, the manner in which he asks for help or presents his complaints, whether or not anxiety is present, the material which he spontaneously presents as well as the areas in which he shows resistance. In his interview with the soldier, the social worker obtains a statement of the problem, its history, and development since the soldier came into the Army. He may also secure information about the soldier's family, education, occupation, health, and Army records. The military psychiatric social worker also attempts to get a complete psychiatric history and, after evaluating this history in terms of the dynamics involved, may offer a tentative impression of the type and significance of the problem. In his position as an enlisted man, such impressions are not official, but they have great didactic value when they are discussed with the psychiatrist in supervisory conferences.

The military psychiatric social worker has been trained in psychotherapy under the direction of a psychiatrist, and the principal kinds of cases which he can handle successfully are those in which anxiety is related to the present situation. "Encouragement, reassurance, generalization of the difficulty, mobilization of resources to meet specific situations, and an opportunity for the patient to find his own solution through interviews were the principal techniques employed by the social worker" in one psychiatric setting, and are indicative of the kind of therapeutic activities practised by the military psychiatric social worker.² Another part of his therapeutic

2. Lehman, Albert: Short-Term Therapy in a Military Setting, *The Family: Journal of Social Case Work*, October 1944.

role consists in strengthening the morale of patients by giving them a better understanding of the issues involved in the war.

In both history taking and therapy, the military psychiatric social worker is supervised by the psychiatrist. In history taking, supervision serves to help him understand more fully what information is needed when specific syndromes are presented. In therapy, supervision by the psychiatrist helps him get a more objective view of the dynamics and of his role in the therapeutic relationship. Supervision helps the military psychiatric social worker understand the meaning of his position as an enlisted man, how better to handle resistances, and helps to develop his skill in a military setting; seminars and lectures are also valuable. With such supervision by the psychiatrist, the enlisted man as a psychiatric aide is better equipped to fulfill his role in helping preserve and salvage manpower in the Army.

Yaws in a White Soldier

CAPTAIN HAROLD RIFKIN

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Yaws is an infectious and contagious nonvenereal disease, limited to tropical countries and caused by organisms morphologically indistinguishable from *Treponema pallidum*. It has been said¹ that yaws is almost exclusively confined to colored races. Infection usually occurs through spirochetes entering a cut or abrasion of the skin, either by direct contact with discharges from the lesion or through the agency of flies. The spirochetes apparently do not penetrate unbroken skin.

A case is presented of a young white male adult who developed yaws while in service in a tropical climate.

CASE REPORT

The patient was a twenty-nine-year-old white soldier who had been on duty for one year in various islands in the South Pacific on which natives are known to have yaws. He was admitted to a general hospital in that area because of a lesion on the distal phalanx of the middle finger of the right hand which had refused to heal despite intensive local therapy with ointments. Two months prior to admission, he had "stuck a splinter in the middle finger of the right hand," following which an ulcer

1. Stitt, E. R., Clough, P. W., and Clough, M. C.: *Practical Bacteriology, Haematology, and Animal Parasitology*, 9th ed. Philadelphia: The Blakiston Co., 1938.

developed in five weeks. A week later there developed an acute ascending lymphangitis of the right upper extremity, with enlargement of the right epitrochlear and axillary lymph nodes. The soldier had played with native black children. He denied sexual contact during the entire stay in this area.

On admission to hospital, examination revealed an ulcer, 12 mm. in diameter, on the volar aspect of the distal phalanx of the middle finger of the right hand, punched out, with a firm, indurated base covered by a yellow-green mucoid exudate and surrounded by a moderate area of induration. A maculopapular eruption was present on the palms and soles of the upper and lower extremities and over the anterior wall of the chest and abdomen. The right epitrochlear and axillary nodes were enlarged, discrete, and firm. The remainder of the physical examination was essentially negative.

A darkfield examination made from the ulcer of the finger revealed an occasional spirochete. In a examination, the epithelium at the edge of the ulcerated area revealed moderate acanthotic activity. The ulcer crater is covered by a thin exudate of fibrin and pyknotic leukocytes. In the underlying corium, there is extensive mononuclear cellular infiltration in which plasma cells predominate. This reaction is characteristically perivascular in distribution. Levaditi's stains reveal spirochetes, resembling *Treponema pertenue*. These are most notably situated in the interpapillary and subpapillary areas. The blood count, smear, and urine examinations were within normal limits. The blood Kahn was reported as positive, 4 plus. Spinal fluid was clear; examination revealed three lymphocytes, a negative Pandy's reaction, and a negative Kahn reaction. The colloidal gold was reported as 0000000000. At this time, a diagnosis of yaws was entertained and a biopsy of the right axillary lymph node was performed. In a number of sections stained by Levaditi's method, treponemata were clearly visible ramifying throughout the lymph cords. The histologic report was as follows:

Microscopic examination reveals preservation of the lymph node architecture. Demarcation between germinal centers and peripheral sinuses is clear. The germinal centers are increased two to three times their usual size and are filled with mature lymphocytes. The peripheral lymph sinuses are infiltrated with large numbers of mononuclear cells, the predominating cell being the plasma cell. There is an extensive perivascular infiltration of plasma cells, lymphocytes, and large mononuclear histiocytes. The ratio of the plasma cells to the lymphocytes is about 2 to 1. The smaller blood vessels reveal a characteristic endarteritic thickening. The histologic diagnosis is lymphadenitis, axillary, right, chronic, productive in nature, lues or yaws in etiology.

At this time it was decided that the patient should receive specific therapy. Mapharsen was given twice weekly and bismuth once weekly. The course of therapy is outlined in table I.

Following the third injection of mapharsen, the Kahn reaction became negative. The lesion on the finger at this time was almost completely healed, with the exception of a tiny indurated area 4 mm. in diameter. Following the fifth injection, the lesion was completely healed. The epitrochlear node was barely palpable. Repeated serologic examination on

three occasions, one week apart, following the course of mapharsen and bismuth therapy, yielded negative results. On discharge, the lesion on the finger had resolved completely. There was no evidence of epitrochlear enlargement. Three months later the Wassermann test was still negative.

COMMENT

This case presents an infection contracted following contamination of an abraded skin surface. The presence of a primary lesion on the finger, lymphadenitis, positive biopsy, and Kahn examinations, the dramatic response to arsenicals and bismuth, plus a history of contact with native children, appear to confirm a diagnosis of primary yaws in a white male adult.

TABLE I

Date	Mapharsen	Bismuth
11-24-43	0.03 gm.	
11-28-43	0.045 gm.	
12-2-43	0.06 gm.	
12-6-43	0.06 gm.	
12-10-43	0.06 gm.	0.13 gm.
12-14-43	0.06 gm.	
12-18-43	0.06 gm.	0.13 gm.
12-22-43	0.06 gm.	
12-25-43	0.06 gm.	
12-28-43	0.06 gm.	0.13 gm.
12-31-43	0.06 gm.	



As American infantrymen cross the Moselle River toward the front, they pass a jeep transporting American and German wounded to the rear. France. 12 September 1944. Signal Corps photograph.

Treatment of Yaws with Penicillin

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Laboratory and clinical investigations have produced findings which suggest strongly the potential value of penicillin in the treatment of diseases caused by spirochetes and closely allied organisms. Mahoney, Arnold, and Harris¹ treated four cases of early syphilis with good clinical results. Bloomfield, Rantz, and Kirby² reported similar success in seven cases. In both groups of patients, lesions showing treponemata on darkfield examination prior to treatment were free of these organisms in seven to fourteen hours after beginning treatment with penicillin, and healing of the lesions was accomplished within two weeks. The dose of penicillin used in the treatment of these cases was large, being of the order of magnitude of 1,000,000 units. The efficacy of penicillin in the treatment of relapsing fever caused by *Borrelia novyi* in mice was demonstrated by Heilman and Herrell³ and by Augustine, Weinman, and McAllister,⁴ and in a subsequent report the former workers⁵ have shown similar good results in the treatment of experimental Weil's disease in guinea pigs. We have felt it desirable to investigate the effect of penicillin on infections caused by *Treponema pertenue*.

In this study, cases of active primary and secondary yaws were selected for treatment if darkfield examination of material from the cutaneous lesions revealed spirochetes

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We are indebted to Mr. J. Eric Pery-Johnson for carrying out the darkfield and serologic examinations and to the medical and nursing staffs of the Colonial War Memorial Hospital, Fiji, without whose cooperation this investigation would not have been possible.

1. Mahoney, J. F., Arnold, R. C., and Harris, A.: Penicillin Treatment of Early Syphilis: Preliminary Report. *Vener. Dis. Inform.*, 24:355-357, 1943, quoted by Crawford, G. M.: Syphilis, *New England J. M.*, 3 Feb. 1944.

2. Bloomfield, A. L., Rantz, L. A., and Kirby, W. M. M.: The Clinical Use of Penicillin, *J. A. M. A.*, 124:627-633, 4 March 1944.

3. Heilman, F. R., and Herrell, W. E.: Penicillin in the Treatment of Experimental Relapsing Fever, *Proc. Staff Meet., Mayo Clinic*, 18:457, 1 Dec. 1943.

4. Augustine, D. L., Weinman, D., and McAllister, J.: Rapid and Sterilizing Effect of Penicillin Sodium in Experimental Relapsing Fever Infections and Its Ineffectiveness in the Treatment of Trypanosomiasis (*Trypanosoma lewisi*), and Toxoplasmosis, *Science*, 99:19-20, 7 Jan. 1944.

5. Heilman, F. R., and Herrell, W. E.: Penicillin in the Treatment of Experimental Leptospirosis Icterohaemorrhagica (Weil's Disease), *Proc. Staff Meet., Mayo Clinic*, 23 February 1944, quoted in *BuMed News Letter*, vol. 3, No. 8, 14 April 1944, p. 3.

morphologically identical with *Treponema pertenue*. To date, eleven patients with no history of previous arsenical therapy have been treated with penicillin. In addition, six patients with active yaws and a history of clinical relapse following previous chemotherapy were admitted for study. Sixteen of the seventeen cases treated had a positive serum Kahn flocculation test prior to beginning treatment with penicillin. The one case with a negative serum Kahn reaction (case 1) had previous arsenotherapy.

All cases treated with penicillin were admitted to a British Colonial Service hospital for observation during and after the period of treatment. The total dosage of penicillin used was set arbitrarily at about 500,000 units. The usual schedule of administration was 15,000 units of penicillin intramuscularly every four hours day and night for five to six days. The drug solution was made daily by dissolving the dry powder in enough sterile normal saline to produce a concentration of 10,000 units of penicillin per cc. Because of possible deterioration of the drug in transit overseas, the bacteriostatic effect of various lots of penicillin against a laboratory strain of *Staphylococcus aureus* was measured and found to equal the effect of a potent preparation described by Rammelkamp and Keefer.⁶ No other treatment, systemic or local, was employed during the period of penicillin therapy. Open, draining, cutaneous lesions were covered with a petrolatum gauze dressing to prevent trauma and the recurrence of bacterial invasion. Lesions covered with a dry eschar were not dressed. Darkfield examinations of material from the lesions in which *T. pertenue* was demonstrated before treatment were repeated sixteen and forty hours after the institution of therapy. Titered serum Kahn reactions were determined during and after hospitalization at weekly intervals, and the patients were re-examined at weekly intervals following discharge from the wards.

The effect of penicillin on the clinical course of active primary and secondary yaws is described in three typical cases and in tables I and II.

CASE REPORTS

CASE 2. A Fijian male, aged fifteen years, was admitted on 19 April 1944, complaining of sores on his skin. A year previously he had developed below his left knee a small ulcerative lesion that had increased gradually in size during the next six months. Several months before entry, new lesions appeared on both legs and two weeks before admission another lesion developed at the mucocutaneous junction of the left external naris. The patient gave no history of any treatment during his illness.

He was well nourished and presented the typical appearance of moderately severe secondary yaws. A large weeping granuloma was present below the left knee, and on both legs were numerous elevated lesions covered with dirty, yellowish, lobulated eschars. A small granu-

6. Rammelkamp, C. H., and Keefer, C. S.: Penicillin; Its Antibacterial Effect in the Whole Blood and Serum for Hemolytic Streptococcus and *Staphylococcus aureus*, J. Clin. Invest., 22:649-657, Sept. 1943.

TABLE I

Case No.	Age	Duration of illness	Severity of illness	Previous therapy	Interval between previous treatment and present treatment	Serum Kahn	Darkfield before treatment	Darkfield after 16 hr. of penicillin treatment	Total penicillin administered—units	State of skin lesions 3 weeks after treatment	Period of observation
1	10	3 months	Moderate	1 arsenic injection	1 month	Neg.	Pos.	Neg.	280,000	Healed	7 weeks
2	15	1 year	Moderate	None		Pos.	Pos.	Neg.	470,000	Healed	7 weeks
3	9	1 year	Severe	3 arsenic injections	1 month	Pos.	Pos.	Neg.	510,000	Healed	5 weeks
4	12	6 months	Moderate	3 arsenic injections	4 months	Pos.	Pos.	Neg.	480,000	Healed	6 weeks
5	1	3 months	Severe	None		Pos.	Pos.	Neg.	420,000	Healed	4 weeks
6	1	1 month	Severe	None		Pos.	Pos.	Neg.	420,000	Healed	3 weeks
7	9	1 year	Moderate	3 arsenic injections	1 month	Pos.	Pos.	Neg.	200,000	Healed	5 weeks
8	3	7 months	Mild	3 arsenic injections	5 months	Pos.	Pos.	Neg.	525,000	Healed	5 weeks
9	4½	1 week	Mild	None		Pos.	Pos.	Neg.	480,000	Healed	4 weeks
10	3	1 month	Moderate	None		Pos.	Pos.	Neg.	540,000	1 lesion not healed	4 weeks
11	4	1 month	Moderate	None		Pos.	Pos.	Neg.	540,000	Healed	3 weeks
12	7	3 months	Moderate	None		Pos.	Pos.	Neg.	540,000	Healed	4 weeks
13	5	4 months	Severe	2 bismuth injections	2 months	Pos.	Pos.	Neg.	450,000	Healed	3 weeks
14	6	1 year	Moderate	None		Pos.	Pos.	Neg.	450,000	Healed	3 weeks
15	9	3 weeks	Mild	None		Pos.	Pos.	Neg.	450,000	Healed	3 weeks
16	17	1 month	Severe	None		Pos.	Pos.	Neg.	450,000	Healed	3 weeks
17	1	2 months	Severe	None		Pos.	Pos.	Pos. Neg. after 40 hours	100,000	Healed	3 weeks

These patients were all Fijian except No. 3, who was half Fijian and half Chinese, and No. 15 who was half European and half Samoan. They were all females except Nos. 2, 11, 12, 13, 14, 16, and 17.

Type of yaws in all of these patients was secondary except No. 4 which was secondary "Crab" and Nos. 9 and 15 which were the primary type of yaws.

loma at the mucocutaneous junction of the left external naris and superficial circinate lesions involving the epithelium of both palms and soles were present. The epitrochlear and femoral lymph nodes were moderately enlarged. Darkfield examination of material from the lesion below the left knee showed moderate numbers of spirochetes morphologically identical with *T. pertenue*. The serum Kahn test was positive; titer, 12 units.

The patient was hospitalized and given an initial dose of 25,000 units of penicillin intravenously. Thereafter, he received, every four hours, 15,000 units of penicillin intramuscularly until a total of 460,000 units had been administered. After sixteen hours of treatment, dark-field examination of material from the lesion below the left knee revealed no treponemata, and the absence of these organisms from the lesions was confirmed by darkfield examination after forty hours of treatment. At

TABLE II
Course of serum Kahn reactions

Case No.	Before treatment	4 days	1 week	2 weeks	3 weeks	4 weeks	5 weeks	6 weeks	7 weeks
1	Neg.		Neg.		Neg.	Neg.	Neg.	Pos. 4 units	Pos. 4 units
2	Pos. 12 units	Neg.	Neg.	Pos. 20 units		Pos. 80 units	Pos. 80 units	Pos. 80 units	
3	Pos. 120 units	Pos. 160 units	Pos. 120 units	Pos. 160 units	Pos. 240 units	Pos. 200 units			
4	Pos. 20 units	Pos. 20 units		Neg.	Neg.		Pos. 240 units	Pos. 240 units	
5	Pos. 4 plus	Pos. 240 units	Pos. 240 units	Pos. 320 units		Pos. 200 units			
6	Pos. 4 plus	Pos. 200 units	Pos. 160 units	Pos. 200 units	Pos. 200 units				
7	Pos. 4 plus		Pos. 240 units	Pos. 200 units	Pos. 240 units	Pos. 200 units			
8	Pos. 2 plus	Pos. 80 units	Pos. 80 units			Pos. 4 units			
9	Pos. 120 units		Pos. 160 units	Pos. 40 units	Pos. 40 units				
10	Pos. 80 units		Pos. 200 units	Pos. 240 units	Pos. 200 units				
11	Pos. 160 units		Pos. 40 units	Pos. 20 units					
12			Pos. 240 units	Pos. 240 units		Pos. 200 units			
13	Pos. 280 units		Pos. 240 units	Pos. 200 units					
14	Pos. 4 units		Pos. 4 units	Pos. 4 units	Pos. 40 units				
15	Pos. 240 units		Pos. 240 units	Pos. 120 units					
16	Pos. 160 units		Pos. 200 units	Pos. 240 units					
17	Pos. 240 units		Pos. 240 units	Pos. 240 units					

this time, all of the lesions appeared improved and less edematous and evidence of secondary infection was less pronounced. Twenty-four hours later, epithelialization of the smaller lesions was noted, and on the eighth day after the start of therapy all of the lesions were completely epithelialized. The patient has been followed at weekly intervals for seven weeks since the beginning of treatment and he has remained well. The course of his titrated serum Kahn reaction is shown in table II.

CASE 9. A Fijian female, aged four and one-half years, was admitted on 6 May 1944 to the outpatient department, complaining of a sore on the right second toe. The lesion had appeared a week previously as a small ulceration which had been covered soon by a thick yellowish crust. There was no history of therapy prior to admission.

Physical examination showed a well-developed and fairly well-nourished female with a circular solitary yaw 18 mm. in diameter, involving the dorsal and medial aspects of the right second toe. The periphery of the lesion was covered with a dirty, yellowish eschar which overlay pale, edematous granulations. The central portion of the lesion was depressed and covered with a greyish eschar. The epitrochlear glands were slightly enlarged. Darkfield examination of material from the lesion on the right second toe revealed numerous spirochetes morphologically identical with *T. pertenue*. The serum Kahn reaction was positive; titer, 120 units.

The patient received 15,000 units of penicillin intramuscularly at four-hour intervals until a total of 450,000 units had been injected. Sixteen hours after the start of treatment, darkfield examination of material from the primary yaw showed no treponemata and this finding was repeated at forty hours. At this time the edema of the granulations had subsided and the eschar had begun to separate. Thereafter, progress was rapid and the lesion healed completely one week after the start of treatment. Three weeks after the commencement of therapy, the lesion remained well healed. The course of the serum Kahn reaction is shown in table II.

CASE 16. A Fijian male, aged seventeen years, was admitted on 24 May 1944, complaining of sores on his face, hands, and legs. About a month previously, an ulcerative lesion on the right fifth toe had developed, and a week later, numerous other lesions appeared on the face, hands, and legs. There was no history of treatment prior to admission.

Physical examination showed a well-developed, rather thin male with the clinical picture of florid secondary yaws. The numerous typical lesions on the face, hands, and legs varied in size from 1 to 3 cm. in diameter. The palm and soles were involved extensively. The right fifth toe was affected in its entirety and appeared to be infected heavily with secondary bacterial invaders. A lesion at the mucocutaneous junction of the right external naris appeared to involve almost completely mucous membrane. The femoral lymph nodes were markedly enlarged. The remainder of the physical examination was normal. Darkfield examination of material from a lesion on the left hand showed numerous spirochetes morphologically identical with *T. pertenue*. The serum Kahn reaction was positive; titer, 160 units. X-ray of the right fifth toe showed decreased density of the phalanges.

The patient received 15,000 units of penicillin intramuscularly at four-hour intervals until a total of 450,000 units had been given. From the beginning of treatment the patient's progress was dramatic. Darkfield examinations revealed no spirochetes after sixteen hours of treatment nor at any time subsequently. At the same time, the darkfield examinations became negative and beginning epithelialization of most of the

lesions was in evidence. The rate of improvement of the right fifth toe was most striking. On admission the entire toe was involved by the infectious process and it was thought then that the toe might be lost. In three days the edema and purulent discharge disappeared, and on the fourth day it seemed possible that the toe might heal without surgical intervention. At the end of nine days the toe was covered completely with epithelium and all of the lesions elsewhere were healed. The course of the serum Kahn reaction is shown in table II.

DISCUSSION

The salient features of seventeen cases of yaws treated with penicillin are presented in table I. Of this group, eleven patients had never received previous therapy, one had been given bismuth, and five had been treated with arsenic at some time before the administration of penicillin was begun. In every case, whether or not there had been previous therapy, the lesions had been progressing unfavorably before hospitalization. In every case, also, organisms morphologically identical with *Treponema pertenue* were demonstrated at the original darkfield examination. The darkfield study, repeated sixteen and forty hours after the commencement of treatment with penicillin, showed no treponemata in sixteen patients. In one case, a single, nonmotile *Treponema pertenue* was found after sixteen hours, but none was present at forty and sixty-four hours. During these first sixteen hours, the dose of penicillin varied from 50,000 to 90,000 units and all of the lesions showed definite evidence of healing at the end of this period. Thereafter, healing progressed with almost spectacular rapidity. Granulomas and ulcers became dry and clean and were soon covered with a firm eschar. Epithelium grew in from the periphery of the lesions and the crusts separated. Ulcers and granulomas several centimeters in diameter healed often within a week. All of the lesions but one were completely healed within three weeks. The one exception, a large, deep ulcer on the right foot of case 10, showed the usual initial improvement, but its epithelialization was impeded by the development of a surrounding ring of fibrous tissue. Treponemata were not demonstrated in the ulcer in five darkfield examinations subsequent to therapy. In the same patient the other numerous lesions healed uneventfully. From the observations noted, we feel justified in stating that the administration of penicillin causes the *Treponema pertenue* to disappear promptly from the cutaneous lesions of primary and secondary yaws and that it produces rapid and complete healing of the skin manifestations of these stages of the disease.

The course of the serum Kahn reactions (table II) reveals no significant changes during the period of observation, which is too brief to be conclusive, and changes in the Kahn reactions may occur subsequently. The following statement by Chambers⁷ concerning the effect of arsenotherapy on the Kahn

7. Chambers, H. D.: Yaws, Leishmaniasis, and Pinta, J. A. M. A., 124:667-668, 4 March 1944.

reaction in yaws is of interest: "In 411 cases of yaws with Wassermann reaction positive treated with six injections of neoarsphenamine the lesions cleared in the usual time but the Wassermann reaction was still positive at the end of six months in 74.56 percent of these cases; it was positive at the end of one year in 55.03 percent; at the end of two years in 31.63 percent of the cases." The clinical importance of a positive serological test in yaws is difficult to evaluate. Because of the apparent rarity of cardiovascular, central nervous system, and other visceral involvement in yaws, a positive serologic reaction may have a significance different from that in syphilis. As one of the criteria of a complete cure of yaws, however, the serologic test should, in the light of present knowledge, become negative and remain so. Our studies of the course of the serum Kahn reaction are being continued.

The optimal dose of penicillin in yaws has not been determined by this investigation. Most of our cases were given a total of 400,000 to 500,000 units of the drug in five days. A dosage of 100,000, 200,000 and 270,000 units of penicillin brought about as prompt and complete healing of the skin lesions as the more vigorous therapy. In view of results of preliminary studies in the treatment of syphilis with penicillin, it appears that the smaller quantities may be sufficient. We have no information on the comparative effectiveness of penicillin and the arsenical compounds in the treatment of yaws. Further investigation of these problems is in progress. The study of a large group of cases and a prolonged period of observation will be necessary for this solution.

CONCLUSIONS

1. In seventeen cases of primary and secondary yaws from which *Treponema pertenue* was isolated by darkfield examination, penicillin caused the disappearance of *Treponema pertenue* from the cutaneous lesions within sixteen hours in sixteen cases and within forty hours in one case.

2. Penicillin therapy brought about complete healing within three weeks of all the cutaneous manifestations of yaws, with the exception of one lesion which failed to epithelialize because of local scar formation.

3. During the short period of observation penicillin did not affect significantly the serum Kahn reaction in yaws.

ADDENDUM.—The authors have submitted, through The Surgeon General's Office, a subsequent paper presenting further observations on the 17 patients discussed in this issue of *The Bulletin* and summarizing their findings on an additional 25 patients treated with penicillin. The combined group comprised 25 cases of primary yaws, 36 of secondary, and one of tertiary, all of whom were hospitalized during treatment and were not discharged until their lesions had healed. In the lesions of 41 patients, darkfield examination before treatment revealed spirochetes morphologically identical with *T. pertenue*; in all but three of them, no spirochetes could be found sixteen hours after the institution of penicillin therapy, and in those 3 cases, no *T. pertenue* was found forty hours following the start

of treatment. The one case of tertiary yaws is reported in detail. This patient had numerous deep-seated scars (such as might follow a severe burn) of previously healed lesions over the extremities and trunk, and the x-ray revealed lesions in both tibiae, the left fibula, and in the right ulna, where an area of destruction 4 centimeters above the wrist joint was accompanied by periosteal proliferation. As he had been refractory to therapy ordinarily used in treating yaws, the authors gave him 90,000 units of penicillin intramuscularly per day until he had received a total of 1,020,000 units. The lesions healed slowly but steadily, and he improved otherwise; however, in view of the chronicity of his illness and a still positive Kahn serum reaction, he was given another total of 2,400,000 units of penicillin. All cutaneous lesions then healed for the first time and x-ray films showed extensive bony repair. The patient's serum Kahn reaction, titer 240 units, was still positive.

The authors' conclusions to their second paper follow: (1) Penicillin brought about the rapid and complete healing of the cutaneous lesions of 41 cases of primary and secondary yaws. (2) Only one clinical relapse occurred and that patient responded to re-treatment. Some patients were observed as long as twenty weeks following institution of therapy. (3) Penicillin was used successfully in treating one case of tertiary yaws which had been previously refractory to therapy with arsenic and bismuth compounds and with potassium iodide. (4) During the period of observation penicillin did not effect permanent seronegativity in any of the 42 cases of yaws treated. (5) The use of 100,000 units of penicillin administered within twelve hours merits further study because of its potential value in the mass treatment of infectious yaws.

Use of the Stress-Breaker in Fixed Bridgework

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Restorative dentistry has made many forward strides, particularly toward a more exact duplication of the physical and biologic phenomena exhibited in the oral cavity. One of the advancements has been the use of the "stress-breaker" principle in fixed bridgework. Introduced to overcome some of the hazards of complete bridge fixation, the stress-breaker allows a more equitable distribution of the load placed on an abutment tooth. In substance, the stress-breaker is a nonrigid connector consisting of two parts: (1) the "keyway" or "female component" is a depression cut in one of the retainers, generally the anterior one; (2) the "key" or "male attachment" is an extension from the pontic which is cast to fit the keyway exactly.

The use of this arrangement is based on sound physiologic principles and is conducive to optimum oral health. In the natural human dentition, each individual tooth is capable of its own separate and distinct movement. In contrast to the full denture in which three-tooth contact is sufficient for stabiliza-

tion in all excursions, it is desirable in the natural dentition to have the maximum number of teeth contacting in any given relation in order to achieve the greatest distribution of stress among the individual units. It is with this distribution of stress, then, that we have to be concerned when dealing with bridge-work of the fixed or movable types. Whatever appliance allows the teeth to take up the stress in accord with their normal movement and function, that is the appliance to be desired.

Each tooth, anchored in its socket by means of elastic periodontal fibers, is capable of limited movement, the extent of which is determined by the number, length, and distribution of these fibers, and the extent of the alveolar bone. The direction of movement depends on the forces acting on the tooth at the moment in question.

Let us consider how the forces acting on a three-unit fixed bridge may influence its success and permanence. What happens, for example, if we apply a direct occlusal force to one of the abutment teeth? (Figure 1) The tooth (A) is depressed in its socket, and, in the process, moves in an arc of a circle the center of which is located in the second abutment (B) and whose radius is determined by the length of the bridge. This movement creates unnatural tipping forces which may result in rotating the tooth out of its retainer, or, if this holds, may easily crush the periodontal membrane and loosen the tooth. Obviously, the longer the bridge, the longer the lever arm and the greater the amount of torque, since the moment of a force about a point is proportional to the quantity of the force and to its perpendicular distance from the point of rotation. Such movement is neither natural nor desirable and is to be avoided if possible. We may do this simply by constructing a movable joint between the pontic and the retainer and so eliminate the danger of a rigid lever arm acting directly upon the tooth.

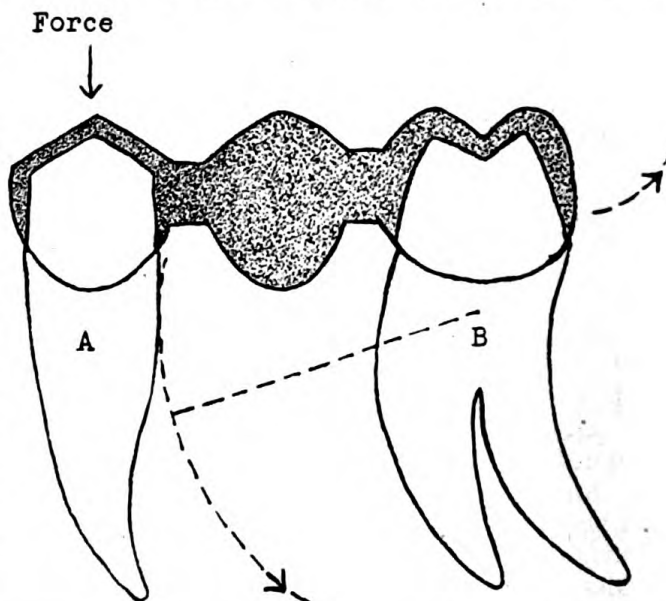


FIGURE 1. Effect of a force on a three-unit bridge.

This, then, is the basis for the construction of a stress-breaker. Further advantages of the use of such an appliance

are: (1) Since the retainers do not have to withstand the displacing forces present in complete bridge fixation, we can utilize simpler preparations; e. g., where formerly a three-quarter crown was indicated on a posterior tooth, a well-prepared two-surface inlay will be sufficient for retention. (2) The greater ease of final insertion. The abutments can be cemented separately and so lessen the chance of error. Again, the single abutment containing the keyway may be finished in the mouth before the remainder of the bridge is cemented. (3) A further advantage, which becomes apparent as the work progresses, is the greater facility of construction. The bugaboo of most fixed bridgework, and the reason for its not being used as often as it should, is that many men shy away from the relatively difficult task of paralleling the abutment preparations. This can be a tedious operation. With the method which has been used in our clinic and which I shall outline, the necessity for achieving parallelism in the mouth is eliminated. This work is accomplished on a model, which makes the work easier, saves chair time, allows greater accuracy, and puts the patient and operator to less discomfort. (4) The use of this type of work has been found very satisfactory in the anterior part of the mouth where esthetic considerations demand a space between the central incisors; e. g., in replacing a missing right central and lateral. With a completely fixed bridge, this space cannot be restored satisfactorily. However, if we build a bulk of gold lingually on the left central abutment to a degree sufficient to allow carving the keyway, we can grind in the pontics, leaving a space through which shows only the extension carrying the key. With the exposed gold unpolished, the case presents a darkened space which appears quite natural in the patient's mouth.

CONTRAINDICATIONS

Notwithstanding its advantages, the stress-breaker principle is not universally applicable. It should not be used in bridges having long spans; it is primarily indicated in one-tooth restorations. Its use is indicated mainly in the posterior part of the mouth. To allow room for the keyway, we must have sufficient bulk of gold, and in anterior teeth this often means sacrificing esthetics. It is also contraindicated if one of the abutment teeth is unduly loose, since this condition will only be aggravated. When the abutment containing the keyway is opposed by natural teeth and the remainder of the bridge is out of occlusion or occludes with a mucosa-borne appliance, the stress-breaker connector should not be employed. Its use will result in the bridge's moving occlusally out of the keyway.

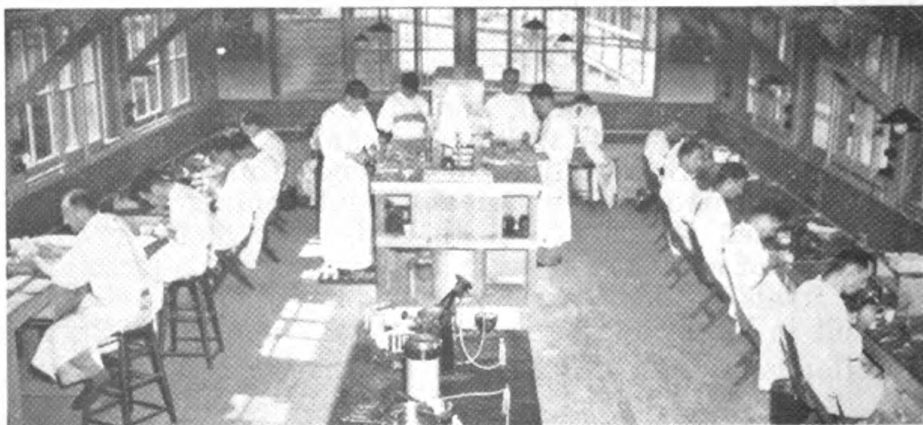
Following is a brief outline of the procedure used in this clinic. It should not be construed as a detailed step-by-step description which must be followed to the letter. The impression technique, the method of mounting models, the antflux used, all this and more may be varied by the individual op-

erator. We have tried rather to set down a general procedure which can be modified and adapted to meet varying conditions.

(1) The abutments are prepared and finished in the mouth. We need not be concerned with parallelism at this time. (2) With the finished retainers in position, a full mouth impression is taken in plaster of paris. (3) A model of the opposing jaw is made, using any available impression material. A bite registration is also made in pink wax. (4) The retainers are removed from the mouth, and the cavity side of the preparations anti-fluxed. We have been using a carbon flame to precipitate a layer of carbon particles over the castings. (5) The castings are seated in the assembled impression, and the abutment teeth isolated with modeling clay, then poured in Melotte's metal. The remainder of the model is poured in stone to reduce shrinkage to a minimum. If a wire clip is used to hold the retainers in position while the metal is being poured, not only will accuracy be assured, but the clips will serve to anchor the abutment teeth to the stone. (6) The models are mounted on an articulator. (7) The posterior retainer is removed and the keyway aligned and cut in the anterior casting directly on the model. Both retainers are now given a final polish and resealed on the model. (8) The cast is relieved, the selected pontic ground into position, and a backing waxed. With the pontic in correct position on the model, wax is flowed into the keyway and joined to the wax backing. The entire assemblage is removed, invested, and cast. (9) The bridge is completed and the patient allowed to wear it temporarily. At the end of a week, the patient returns, minor adjustments are made, the pontic is cemented to the bridge, and the bridge inserted in the patient's mouth.

SUMMARY

The stress-breaker principle is based on the soundest physiologic considerations. This type of bridge is as easy to construct as a completely fixed appliance. The technique used saves chair time, wear and tear on the patient and dentist, and is more accurate. Within its limitations, it affords a better restorative service to the patient. We have been gradually doing more of this type of work in our clinic and recommend its trial by other operators as part of routine clinic practice.



Base Section 3 dental laboratory at 42d General Hospital, Brisbane, Australia, showing, in center, plaster bench and the curing and vulcanizing tables. Signal Corps photograph.

Treatment of Acute Gonorrhea with Penicillin Results in 100 Cases

MAJOR JOHN H. LONG
Medical Corps, Army of the United States

In this theater in the Southwest Pacific all cases of acute gonorrhea are admitted to hospital and remain there until cured, so that constant observation and detailed laboratory studies can be carried out. When penicillin became available for the treatment of acute gonorrhea, a detailed study was made of the first 100 cases treated. The following procedures were carried out:

1. A smear and a culture of the discharge were made on admission. No cases were included in the series unless the smear or culture, or both, were positive. In one case the smear was negative and the culture positive; in one case, the culture negative and the smear positive. All the remaining cases had smear and culture both positive. Smears were stained by Gram's technique. Cultures were made by separating the lips of the urethral meatus, collecting a small amount of the purulent discharge on a sterile cotton swab, smearing it on a chocolate agar plate, then incubating at 36° C. for forty-eight hours. The plates were then examined after staining with peroxidase. Gram's stain and identification on carbohydrate media were used on all doubtful cultures.

2. If the smear was positive, the patient was given 100,000 Oxford units of penicillin (20,000 units intramuscularly every three hours for five doses) the next day after admission, without waiting for the culture report.

3. A smear and a culture of the discharge were made immediately before the first injection and at intervals of four, eight, and twenty-four hours after the first injection.

4. Observation was made of the amount and character of the discharge at these same intervals, and on each morning thereafter, during the hospital stay.

5. The urine was examined before treatment and each morning thereafter.

6. As soon as the discharge ceased, or was no longer purulent or mucoid, 5 cc. of 0.5 percent silver nitrate were instilled into the anterior urethra, retained for five minutes, and in three to four hours a culture was made of the resulting exudate, the patient not having voided in the meantime.

7. One day later a gentle prostatic massage was done, the fresh smear of the secretion examined, and a culture made.

8. The patient was discharged forty-eight hours later, provided there was no recurrence of the discharge.

Since the completion of this report of 100 cases, an additional 160 cases of acute gonorrhea have been cured with penicillin. In this group, two patients required a second course and one a third course of penicillin.

9. A letter was sent to the medical officer of the patient's unit, requesting a report within one month as to whether or not there was any discharge present and a report of urinalysis.

The results of smears and cultures taken before treatment and at intervals of four, eight, and twenty-four hours after the first injection of penicillin are shown in table I. In 95 of the cases, smears were negative four hours after the first injection; in all cases, smears were negative after eight hours. Cultures in 35 of the cases were negative four hours after the first injection; in 91 cases, negative after eight hours; and in all cases, negative after twenty-four hours.

Observations on the character of the discharge after treatment are shown in table II. The amount and character of the discharge presented a striking change. There was little change during the first twelve hours following initiation of therapy. At the end of twelve hours the discharge had ceased to be frankly purulent in most cases and was

TABLE I
Results of smears and cultures

Interval	Smear		Culture	
	Positive	Negative	Positive	Negative
Before treatment	99	1	99	1
Four hours after beginning treatment	5	95	65	35
Eight hours after beginning treatment	0	100	9	91
Twenty-four hours after beginning treatment	0	100	0	100

either mucopurulent, mucoid, or thin and clear. Seventeen patients had no discharge twenty-four hours after the first injection nor during the remainder of the hospital stay. Seven-

TABLE II
Urethral discharge after penicillin therapy

	Days after treatment					On leaving hospital
	1	2	3	4	5 to 9	
No discharge (number of cases)	17	73	85	91	96	97
Type of discharge:						
1. Purulent	17	3	0	0	0	0
2. Mucoid	33	14	5	2	1	1
3. Thin clear	33	10	10	7	3	2
Total number with discharge	83	27	15	9	4	3

teen patients had a small amount of purulent discharge at the end of twenty-four hours and 3 at the end of forty-eight hours. Sixty-six had some mucoid or thin, clear discharge for from one to nine days. Of the entire group, all except 3 were completely free of discharge on leaving the hos-

pital. One of these had a slight mucoid discharge, and 2 had a slight, thin, clear discharge. In all cases of persistent discharge, repeated smears and cultures were made, and all were negative.

The gross appearance and results of microscopic examination of the urine are tabulated in table III. The urine was grossly clear and contained no shreds in 57 of the patients at the time of leaving the hospital. The microscopic examination was negative in 61. It was observed that in some patients the urine became grossly clear and negative microscopically for from two to four days after receiving penicillin; then small shreds would reappear and occasionally white cells would again be abundant on microscopic examination. This was presumed to be due to secondary infection in small ulcerations in the urethral mucosa which had been cleared of gonococci by the penicillin.

TABLE III
Urine examination after penicillin

Gross			Microscopic			
Clear	Clear with shreds	Cloudy with shreds	0-10 WBC/HPF	Countless WBC/HPF	10-20 WBC/HPF	20-100 WBC/HPF
57	33	10	61	3	32	4

In the entire group the tests of cure failed to show the presence of the gonococcus. All urethral cultures were negative after provocative silver nitrate instillation. All cultures of the prostatic secretion were negative. The prostatic examination was normal in 75 cases. Various degrees of enlargement or change in consistency were found in 25 of the patients. The number of white blood cells in the fresh prostatic smear was normal in 62 of the group; there were 10 to 20 white blood cells in a high-power field in 12; 20 to 159 white blood cells in a high-power field in 19; and a countless number in 7.

TABLE IV
Prostatic examination after penicillin

Normal	Enlarged	Fresh smears				Culture	
		Normal WBC	10-20 WBC/HPF	20-100 WBC/HPF	Countless WBC/HPF	Negative	Positive
75	25	63	11	19	7	100	0

RECURRENCES

There were 4 recurrences in the entire group after the first course of 100,000 Oxford units of penicillin. A résumé of each case follows:

1. The smear and cultures were negative four hours after the first injection. One day after treatment there was a slight clear discharge; smear and culture were negative. Two days after first injection there was no discharge. Urine was clear with a few shreds. Provocative silver nitrate was given; culture was negative. Three days after penicillin therapy, prostatic massage was done. Examination revealed slight enlargement of right lateral lobe. Fresh smear was loaded with leukocytes; culture, negative. On the fourth day after treatment there was a slight purulent discharge; on the fifth day the discharge was profuse, purulent; the smear and culture were positive. Six days after the first course of therapy a second course was given—100,000 Oxford units of penicillin in ten hourly doses of 10,000 units each. Smear and culture were negative eight hours after first injection. One day later there was a slight, thin, purulent discharge, smear and culture of which were negative. Two days later there was slight, thin, clear discharge. On the third day and during the remaining three days of hospital stay there was no discharge. Culture was again negative after provocative silver nitrate instillation. No secretion could be obtained from prostatic massage.

2. Smear and culture were negative eight hours after first injection of penicillin. There was a slight purulent discharge one day later. Smear was negative, but the culture report (requiring forty-eight hours of incubation) was positive. On second day after treatment, there was no discharge. Urine was clear with very few shreds. Provocative silver nitrate instillation was given; culture was negative. On the third day, prostatic examination revealed a grossly normal prostate; however, there were 40 to 50 white blood cells (high-power field) in the unstained smear; culture was negative. On the fourth day after therapy, there was a profuse purulent discharge with positive smear and culture. On the fifth day after initial therapy, the patient was given 100,000 Oxford units of penicillin, 10,000 units hourly for ten doses. The smear became negative in four hours, the culture negative in eight hours after the first injection. One day later there was a slight clear discharge which continued in diminishing amount until the fourth day after the beginning of the second course of medication. For the remaining three days in hospital there was no discharge. The urine remained clear and was normal on microscopic examination. Culture was again negative after provocative silver nitrate instillation. Prostate was again normal; the unstained smear was normal and the culture of the secretion, negative.

3. Smear was negative four hours, culture eight hours, after first injection of penicillin. One and two days later there was a diminished amount of purulent discharge with negative smear and culture. The urine was clear with a few shreds; there were countless leukocytes on microscopic examination.

On the third day after treatment, the discharge was more profuse and the smear and culture were positive. On the next day 100,000 Oxford units of penicillin were given in ten hourly doses of 10,000 units each. Smear and culture were negative four hours after the first injection. On the first day after the second course there was a moderate purulent discharge, on the second and third days a slight clear discharge; then no discharge the remaining four days in hospital. Culture was negative after provocative silver nitrate instillation. The prostatic examination was normal, the culture negative. The urine was clear and normal microscopically.

4. Smear was negative four hours, culture eight hours, after first injection of penicillin. One day later there was a slight, thin, clear discharge. On the second, third, and fourth days there was no discharge. The urine became clear with a rare shred and was normal microscopically. The culture was negative after provocative silver nitrate instillation. The prostate was slightly larger than normal but the unstained smear was normal; the culture was negative. Five days after initial therapy there was a recurrence of a slight purulent discharge. The smear and culture were positive. The next day 100,000 Oxford units of penicillin were given in ten hourly doses of 10,000 units each. The smear was negative four hours, the culture eight hours after the first injection. There was a slight mucopurulent discharge one day after the second course of therapy; then no discharge during the remaining five days in hospital. Culture was again negative after provocative silver nitrate solution. The prostate was slightly enlarged; the fresh smear contained 8 to 10 white blood cells (high-power field); the culture was negative. The urine at the time of leaving hospital was clear, with a few small shreds; there were countless leukocytes on microscopic examination.

Summarizing the recurrences, the smears and cultures became negative in all cases by eight hours after the initiation of therapy; they again became positive one, three, four, and five days later, respectively; 3 cases became entirely free of discharge before recurrence; all were cured by a second course of penicillin given in ten hourly doses of 10,000 units each.

The average hospital stay for the entire group was less than seven days. This was increased because of recurrences in 4 patients who were in hospital from twelve to fourteen days, and by one patient who had complicating acute epididymitis on admission, whose stay was eleven days. In the latter patient, the epididymis had returned to normal by the time of release from hospital.

At present, somewhat over two months since beginning this study, reports of examination at the end of one month on 22 of the group have been received. None has had any discharge since leaving hospital, and the urinalysis is reported negative in every case.

In view of these observations a new routine has been adopted at this hospital. Penicillin injections are started as soon as a positive smear or culture is obtained. If the discharge is not purulent at the end of twenty-four hours, or if the smear and culture are negative at this time, the patient is discharged the next day, tests of cure being omitted. The majority of patients are now in hospital for no more than three days. This procedure is recommended in all theaters where hospitalization for gonorrheal infection is required.

SUMMARY AND CONCLUSIONS

An analysis of the results of treatment of 100 consecutive cases of acute gonorrhea is presented. In 95 cases the smears were negative in four hours, and in all cases, negative eight hours after the first injection. In 35 cases the cultures were negative in four hours, 91 in eight hours, and in all cases twenty-four hours after the first injection. Ninety-seven cases had no discharge at the time of leaving hospital. The urine was grossly clear in 57 cases and microscopically normal in 61 cases at the time of release. Tests of cure were normal in the entire group. In 4 cases there were brief relapses, in one to five days after initial treatment. All of these responded promptly to a second course of penicillin.

Penicillin offers the most effective and most rapid method for the treatment of acute gonorrhea yet available. Treatment could be carried out while a soldier remains on "duty status" in the majority of cases. Hospitalization will probably not be a necessary part of routine treatment in the future.



Soldier wounded on the Volturno front holds shell fragment that pierced his helmet. He was wounded also in the arm and back. Signal Corps photograph.

Inspection of Oysters

MAJOR GEORGE W. SNOOK
Veterinary Corps, Army of the United States

Because of the confusion in available literature, inexperienced inspectors may sometimes reject certain oysters as being unfit for food when they are in fact entirely edible. A discussion of the physical and chemical properties of oysters and methods of testing may be of some assistance to Veterinary Corps officers engaged in the inspection of this sea food.

Oysters contain both protein and carbohydrates and when they decompose, fermentation, as well as putrefaction, occurs. Following the death of the oyster, which occurs soon after shucking, the glycogen is hydrolyzed to produce sugars which, in turn, are fermented by bacteria to produce acid. Acid production is gradual and a direct relation exists between hydrogen-ion concentration and the stage of decomposition. The edibility of oysters can be determined readily, therefore, by the use of pH tests.

A chart for oyster analysis furnished by Field Headquarters, Office of The Quartermaster General, Chicago, shows the edible zone to be above pH 5.9. If the oysters are kept under proper refrigeration, the lower limit of this zone, pH 5.9, is reached about eleven days after shucking. Freshly shucked oysters normally show a pH of between 6.3 and 7.1, depending on the location of the oyster beds from which they were removed. When the pH drops to between 5.7 and 5.9 the oysters are considered "stale," and when a pH below 5.7 is reached they are considered "sour." Therefore, in the standards established by Field Headquarters, 7 October 1942, oysters must show a pH of not less than 6.2 at origin, and not less than 6.0 at destination. In making pH tests, best results are attained by using a Taylor Slide Comparator, a La Motte Block Comparator, or a potentiometer. All inspectors at point of origin now use the Taylor Slide Comparator, but a shortage of these this past season resulted in a few using nitrazine paper. The poor results obtained with the latter necessitated an immediate change to the more accurate tests.

The Taylor Slide Comparator, which is a nonstandard item, may be obtained from the Medical Department on requisition. The pH determination consists of three operations: (1) Remove the top from the base, fill three of the test tubes to the mark

Colonel G. L. Caldwell, V. C., and Captain R. N. Roerig, Sn. C., assisted in preparing this paper.

(5 cc.) with the sample of oyster liquor, and place them in the holes back of the three slots in the base. (2) To the middle tube add 0.5 cc. of the indicator solution, chlorophenol red, and mix thoroughly. (3) Place the color standard slide on the base, and, holding the instrument toward a source of daylight, move it in front of the test samples until a color match is obtained. The pH is then read off directly from the values on the slide. In making a series of determinations on oyster liquor samples, remove the middle tube, clean and refill with 5 cc. of another sample, add 0.5 cc. of the indicator and proceed as outlined.

OYSTER LIQUOR

In the past, several rejections have been made which were based solely on the milky color of the oyster liquor. Normally, the liquor on fresh oysters shows a translucent milky color which appears within a few hours after packing for shipment. This milky color is more pronounced during the spring months when the oysters are beginning to spawn. The large, plump, white oysters grown in the New Jersey beds produce a highly milky liquor the entire season. This condition in no way impairs the quality of the oysters. Liquor from "sour" oysters in which gas, acid, and odor have developed will show a milkiness which is opaque and grayish. The liquor is also stringy and has an offensive odor. The edibility of intermediate or "stale" oysters is more difficult to judge and a pH will indicate their true condition.

The examination of oysters as a potential carrier of infection is based on the presence of *Escherichia coli*, which is always present in the intestinal tracts of man and animals. Federal specifications require an *Esch. coli* score of not more than 50. Veterinary officers on duty at oyster plants are required to submit samples to Army laboratories weekly for examination and any high score necessitates immediate investigation. These tests are in addition to the constant sampling accomplished by state and Federal health authorities.

The *Esch. coli* score is based on the fermentation of lactose broth with the production of acid and gas and the subsequent confirmation of *Esch. coli* in the tubes showing this fermentation. A measured amount of the oysters and liquor are minced aseptically and diluted with an equal volume of sterile 0.85 percent saline. From this original mixture, 1:10 and 1:100 dilutions are prepared. A series of fifteen tubes of standard lactose fermentation tubes are inoculated with these dilutions; five tubes are inoculated with 1.0 cc. of the original suspension prepared, five tubes with 1.0 cc. of the 1:10 dilution, and five tubes with 1.0 cc. of the 1:100 dilution. All tubes are then incubated forty-eight hours at 37° C. Any tube showing acid and gas at the end of this time is examined to confirm the presence or absence of *Esch. coli*, employing the usual confirmatory media. Results of the fermentation tests and confirmation of the presence of *Esch. coli* are expressed in the following tabular form:

"The Manual of Recommended Practice for the Sanitary Control of the Shellfish Industry," published by U. S. Public Health Service, recommends the practice of deter-

Fermentation tubes	1.0 cc.	0.1 cc.	0.01 cc.	Numerical value
1	+	+	—	10
2	+	+	—	10
3	+	—	—	1
4	+	+	+	100
5	+	—	—	1
<i>Esch. coli</i> score				122

mining the most probable number of coliform bacteria present in growing waters and shucked shellfish. An m.p.n. (most probable number) value of 240 or more per 100 ml. of sample of shucked stock at origin or an m.p.n. value of 1,300 or more at destination is interpreted as an indication of unfavorable conditions or practices surrounding the production and handling of the product. Until Federal specifications are changed, *Esch coli* scores will continue to be our index of quality, but the m.p.n. of coliform organisms as an indication of sanitary quality is gaining favor and may eventually replace the other methods.

GREEN-GILLED OYSTERS

Literature available to veterinary officers recommends the rejection of green-gilled oysters. Authorities agree that this condition is caused by the accumulation in the gills and mantle of the oyster of a bluish or greenish pigment derived from certain types of diatoms which normally live in sea water and are ingested by the oyster. In a letter dated 17 March 1944, P. S. Galtsoff, in charge of Shellfishery Investigation, Department of Interior, states, "The pigment of some of the diatoms is stored temporarily in the blood cells of the mollusks filling up the blood vessels of the gills and of the mantle. Greening persists as long as this particular type of diatom is present in the water." Galtsoff believes that oysters coming from certified area should not be condemned because of their color. He has records of several instances in which a yellow, dark brown, or golden color has developed in the gills of oysters, but in each instance he has shown the color to have been caused by a pigment derived from some natural food.

Dr. Thurlow C. Nelson, professor of zoology at Rutgers University, wrote as follows to Dr. Lewis Radcliffe, director, Oyster Institute of North America:

"I spent some time in 1931 visiting the oyster producing areas, particularly Marennes and Arcachon in France. Here oysters are placed in basins or *claires* on purpose to make them green. In these basins the diatom, *Navicula ostrearia*, confers the green color on the oyster. There is no more reason for ruling against green oysters than to reject the outer stalks of celery which are greenish. Both are green for the same reason—the presence of greenish plant pigments."

A. C. Hunter and C. W. Harrison, in U. S. Department of Agriculture Technical Bulletin No. 64, March 1928, state: "As it is well established that the color in green-gilled oysters is due to microscopic plants, which are not injurious when eaten, and as the presence of this color in no way indicates that the oysters are either decomposed or polluted, there can be no objection to the sale of green-gilled oysters because they are green."

A second type of greening, extending over the body of the oyster, is characterized by a bluish hue. In the letter mentioned, Galtsoff states that it is associated with the accumulation of an excess of copper in the blood cells and in extreme cases the oysters may acquire a slightly metallic taste. The exact mechanism of the accumulation of copper is not known. So far as he knows, no evidence has been presented that the consumption of these oysters is harmful although the coppery flavor may be objectionable to the consumer.

PINK OYSTERS

Shucked oysters, although properly iced, when shipped long distances or held in storage for several days may develop a pink color which is due to the growth of a yeast present on equipment such as boats, conveyors, bins, and wheelbarrows; the shell becomes contaminated and the oysters are infected during the shucking and handling processes. A thorough disinfection of the oyster-handling equipment is necessary when this condition develops.

The appearance of this pink color indicates that the oysters are not fresh and therefore should be considered undesirable as a food product. Other inspection methods may prove these oysters to be "stale" or even "sour."

SUMMARY

A pH test is the best method of detecting spoilage in oysters. For reliable pH readings, use the Taylor Slide Comparator, a La Motte Block Comparator, or a potentiometer. Nitrazine paper should not be used. Milky liquor is a normal property of oysters, but when in doubt take a pH reading. The only satisfactory method of preventing spoilage of freshly shucked oysters is the liberal use of ice in direct contact with cans and the avoidance of contamination. Green oysters should not be rejected because they are green. Pink oysters should be considered as "stale" and not issued to troops.

Monthly Meeting.—At the meeting of officers of the Medical Department at the Army Medical Center, Washington, D. C., 18 January, Colonel E. Standlee, M.C., Deputy Surgeon, MTOUSA discussed "Medical Service in the Mediterranean Theater," and Major Calvin S. Drayer, M.C., Neuropsychiatric Consultant, 5th Army, "Combat Psychiatry." The film "Introduction to Combat Fatigue," followed.

Suggestions on Immobilization of the Hand

CAPTAIN DONALD R. PRATT

Medical Corps, Army of the United States

Proper immobilization is a fundamental principle in the treatment of war wounds and injuries. This is especially important in wounds and fractures of the hand, which are common in modern warfare, since it is often necessary for different medical officers to attend these casualties during the period of initial treatment and evacuation. Thus, it seems important to outline the most suitable positions and types of immobilization for the injured hand.

Good motor function in the hand depends on: (1) a wrist stable in dorsiflexion; (2) an opposable thumb for pinch and grip; (3) full flexion of the fingers and thumb for grasping; (4) ability to fix the fingers in partial flexion to act as a hook; (5) extension to open the digits for grasping. Therefore, in the treatment of hand injuries, normal anatomical and mechanical elements essential to good function should be preserved. Unnecessary crippling is often encountered because the injured tissues are not adequately supported soon after injury.

To immobilize effectively, splints or casts must be form-fitting and must include at least two-thirds of the circumference of the limb. The hand can best be immobilized in a plaster of paris cast or, if available, a well-fitting metal or plastic splint. It is important that the bones and joints be maintained in the "position of function," and that the splint include the joints immediately above and below the fracture site. If the fragments are not stable when reduced, skeletal traction or fixation may be resorted to with a nonpadded or lightly padded cast. If the surgeon's experience with plaster is limited or the injury is recent, it is safer to use padding. In the applica-

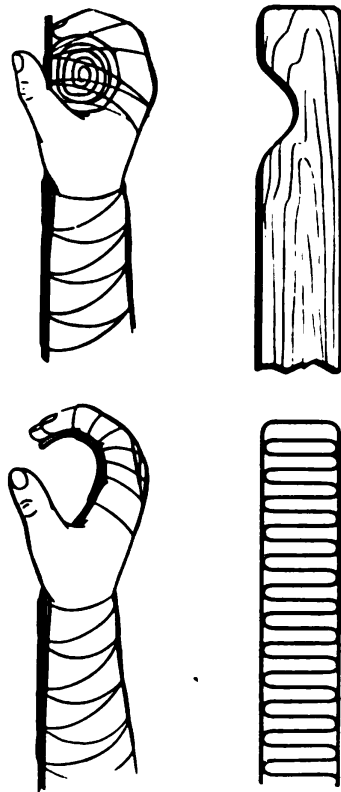


FIGURE 1. Satisfactory temporary board and wire splints with wrist cocked up, fingers flexed, and thumb free.

tion of nonpadded casts, flat plaster splints should be molded in place by a gauze bandage. When the plaster is firm, the gauze is completely cut longitudinally, and, similarly, if circular plaster bandages are applied, the cast must be completely bivalved, to avoid constriction during the early period of treatment.

The position of function of the hand must always be kept in mind when immobilizing the upper extremity, because it is *function* that we aim to preserve or restore. The elbow joint is best immobilized at right angles with mid-supination pronation of the forearm. In the wrist, 20- to 30-degree dorsiflexion and slight ulnar flexion are essential to preserve muscle balance and

a strong grip. The palmar arch is formed by the position and shape of the metacar-

pals which produce a hollow palm and a convex surface on the dorsum of the hand. Maintenance of the palmar arch controls the strength of grasp with serial flexion of the fingers toward the tubercle of the scaphoid. The thumb moves in all directions, including extension, flexion, adduction, abduction, and opposition. The position of opposition is most important and in order that this function be maintained the thumb must *never* be immobilized in the flat or side position. Finger motion includes extension, flexion, and lateral motion and in order to preserve freedom of movement, the fingers should never be immobilized beyond the metacarpophalangeal joints unless definitely indicated and then in a semiflexed position and for as brief a period as possible.

The collateral ligaments of the metacarpophalangeal joints retain their maximum length in the position of flexion but shorten and tend to become permanently



FIGURE 2. Application of slabs for form-fitting bivalve plaster cast to allow for swelling. Wax paper separates slabs. Fingers and thumb are free to move.

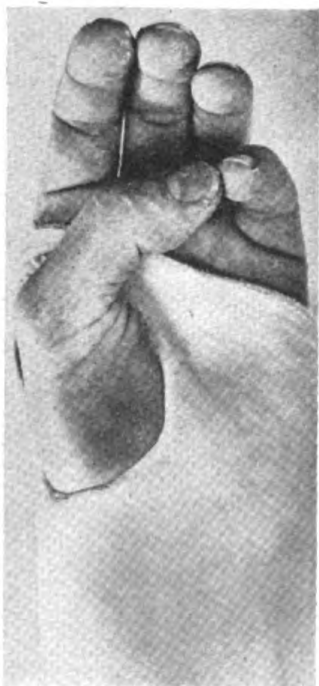


FIGURE 3. Wrist immobilized with thumb free to oppose little finger. Note arch of palm. Plaster ends at distal crease in thick rather than feather edge. Strong, narrow band across thumb web.

contracted in the position of extension. If the latter position is continued for a long period without free mobility, permanent limitation of flexion and serious loss of function follow. These joints, therefore, should always be kept mobile unless immobilization is absolutely essential, and then they should be splinted only in the position of flexion.

Fractures of the metacarpals and phalanges should be reduced and immobilized with special care. The wrist is usually dorsiflexed to relax the extensor muscles of the wrist and finger. The fingers are flexed to relax their long flexors and intrinsic muscles. The forearm should be immobilized in plaster, leaving the thumb free and the palm supported to preserve its arch while only the involved fingers are immobilized. These fingers are flexed: proximal metacarpophalangeal joint about 45 degrees, middle joint 90 degrees, and distal joint in full flexion. Phalangeal fractures are best reduced and immobilized with a simple cast with traction, observing the above positions. In fractures without displacement, skin traction is used. When displacement is present, pulp traction with a pin or, for prolonged periods, skeletal wire traction through the proximal intact phalanx is advised.

There are a number of special uses of plaster of paris in splinting the hand. Following repair of flexor tendons, a dorsal plaster slab is used to keep the hand and wrist in moderate palmar flexion, but the fingers are not acutely flexed. For repair of extensor tendons of the wrist, fingers, or thumb, a volar slab is used to maintain extension. An encircling cage of wire ladder splint incorporated in a non-padded cast affords an open air dressing and the hand may be enclosed in gauze to give adequate protection from injury.

The usual banjo type of splint which incorporates traction with extension is pernicious and should be condemned. Its straight pull on the fingers in extension leaves them stiff and also results in malunion of fractures. When used in flexion, the line of pull is wrong and places a strain on the fingers. In the normal hand or in the injured hand immobilized with a proper splint, the digits flex to converge toward a single point.

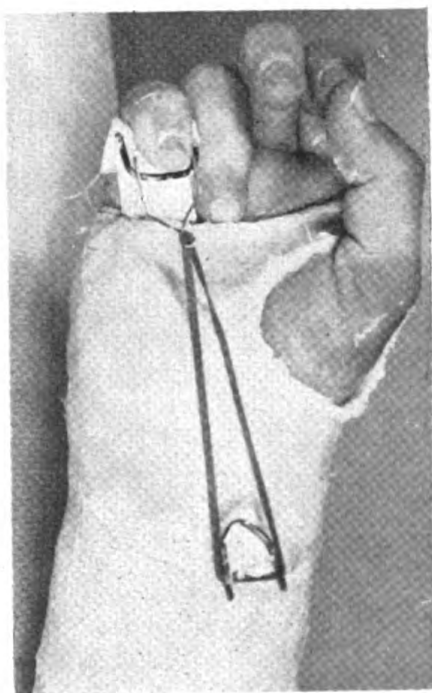


FIGURE 4. Anteroposterior view showing individual finger pulled in direction of tubercle of carpal scaphoid. Adjacent fingers and thumb free to flex and extend completely; palmar arch maintained.

Metal splints for the wrist consist of: (1) volar cock-up wrist splint with a forearm plate and pad in the palm, or (2) a dorsal metal wrist splint composed of three cross plates on a longitudinal rod molded to the contour of the hand and forearm. Care should be exercised not to produce a flat hand. For the hand proper, a triangle metal splint may be used in the palm, or a slightly curved one may be strapped to the dorsum. Aluminum metal gutter splints formed to fit the fingers with varying angles of flexion may be applied to either the dorsal or the volar aspect of the injured finger.

Extremities with injured nerves should also be splinted. In injuries of the radial nerve it is important to support the wrist in dorsiflexion and the proximal segments of the fingers and thumb in moderate but not hyperextension. This splint must be removable or, in the case of fractures proximal to the metacarpals, that portion extending beyond the metacarpophalangeal joints must be removable, in order to permit daily motion of the fingers. This type of immobilization prevents contractures until a spring wire or elastic traction type of splint, which permits constant motion, is available.

Dependent edema due to casts and dressings that are too tight results in ischemia and if allowed to persist, necrosis and gangrene. Elevation of the hand and bivalving the cast lessen this danger and therefore, during the early period treatment when swelling is greatest, importance of splinting the cast must be emphasized.

Prolonged and too extensive immobilization or faulty position of the joints results in atrophy and stiffening of function of the fingers. Actually, there is no difficulty in combining the two principles of immobilization of the injured part and mobilization of the uninvolved joints. Function of the wrist is adequately maintained by finger exercises and, if supported in the proper position, immobilization of the wrist proper does not present a serious problem.

SUMMARY

When the hand is immobilized, observe the best functional position of wrist and digits. Apply only the minimum amount of rigid fixation compatible with the injury involved. Never immobilize the metacarpophalangeal or interphalangeal joints in extension.

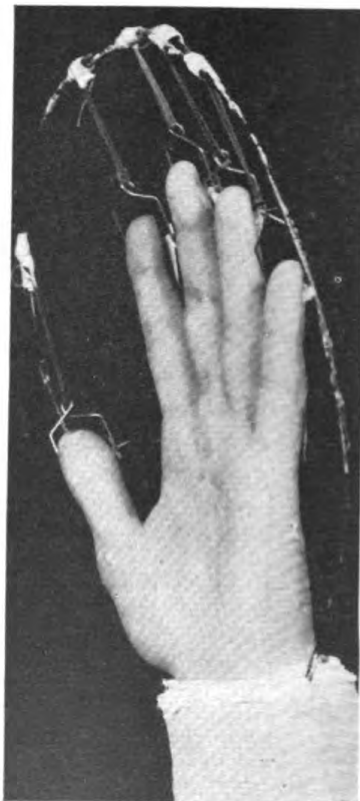


FIGURE 5. Improper use of a banjo splint with digits in extension which always results in flat hand and stiff fingers.

X-ray Department in Southwest Pacific Area

LIEUT. COLONEL DAN TUCKER

Medical Corps, Army of the United States

and

CAPTAIN ARTHUR J. TILLINGHAST

Medical Corps, Army of the United States

The problems involved in constructing and operating an Army x-ray department in the tropics may be of interest to those who encounter a similar situation. When the Ninth General Hospital was being set up at an advanced base in the Southwest Pacific Area, the x-ray department was to occupy a building 80 by 20 feet with a concrete floor, wooden frame, and galvanized iron roof. When we took over with our equipment still in packing cases, the frame, roof, and floor were complete. We were given a free hand to use the space as we saw fit. Of the five field units provided, three were complete with field table and two had mobile bases and upright tube stands. The equipment included also a urological table with a Potter-Bucky diaphragm and a vertical stereoscopic cassette changer. It was decided to have three radiographic rooms, and a fluoroscopic room with both a vertical and horizontal roentgenoscope. The two mobile-base machines were to be used as portable units when necessary but would serve also as part of the stationary apparatus. The plan decided on is shown in figure 1.

X-ray protection. As sheet lead and cement were available only in limited quantities, we used sand to x-ray-proof the walls. The hydrostatic pressure exerted by sand made necessary very strong retaining partitions, constructed of studs cut from ship's dunnage, interlaced with packing-box wire, and covered with building paper, wire netting, and pressed wood (figure 2). The double retainers were filled to a height of $7\frac{1}{2}$ feet with clean, dry beach sand.

The retainers were spaced at 10 inches, making 9 inches of sand at the studs and 10 inches between. It was thought that this was all the walls would hold without bursting. No data or r-meter was available with which to find the lead equivalent of sand. Subsequent direct-exposure tests and film-carrying tests on technicians would indicate that this is more than adequate.

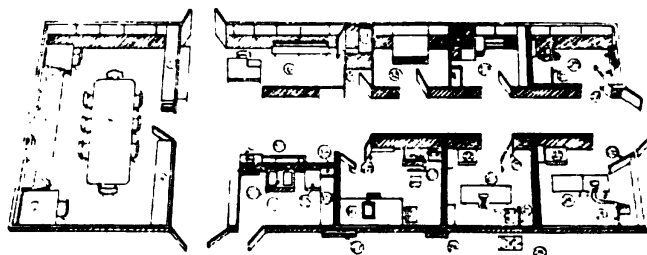
Much credit is due the detachment men of the x-ray department without whose skill in construction and improvisation the department would never have been completed.

Sufficient lead was available to place a shield $3\frac{1}{2}$ feet by 7 feet in each roentgenographic room and to construct lead-backed doors for the roentgenographic and the roentgenoscopic rooms. These doors were hung so that the sanded walls overlapped the lead. The ceilings were made of building paper and the outside walls of building paper, fly screen, and burlap sheeting.

Film processing system. The darkroom equipment consisted of an electric processing unit of standard design, a cypress wood wash tank, and a combination dryer-loading bin unit, which were too small for the volume of work expected. We therefore improvised larger processing and wash tanks and a dryer, using so far as possible the equipment supplied.

The capacity of the developing and hypo tanks was doubled, at the expense of the intervening wash water, by constructing wooden tanks of white pine from packing boxes and metal drawrods salvaged from shutter holders.

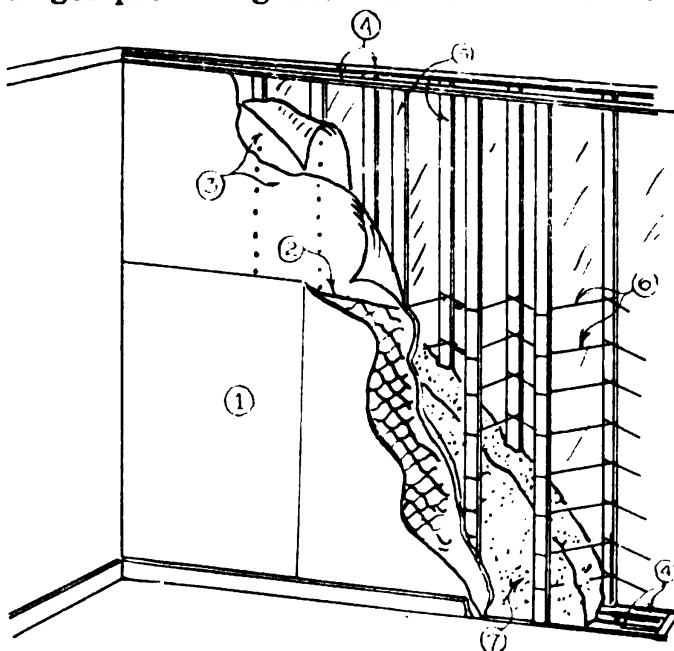
The dryer unit was disassembled and the fan and the heating element used to construct a dryer with a capacity of 88 films in four tiers with notched wood racks to receive the hangers (figure 3). The heating element



X-RAY DEPARTMENT - GENERAL HOSPITAL

1. Electric processing unit
2. Wash tank
3. Dryer-loading bin
4. Combination dryer-loading bin
5. Wash tank
6. Wash tank
7. Wash tank
8. Wash tank
9. Wash tank
10. Wash tank

FIGURE 1. Bird's-eye view of department.



Cut away view of sand filled walls

- | | |
|-------------------------------|----------------------|
| (1) Pressed wood | (5) 1" x 2" studs |
| (2) Wire netting | (6) Reinforcing wire |
| (3) Two layers building paper | (7) 10" x 7" sand |
| (4) 1" x 2" plates | |

FIGURE 2a. Construction of walls.

was placed at the bottom and the fan, blowing outward, at the top. The air intake was placed at the bottom, rear, and the entering air came from the darkroom through a light maze made of wooden partitions and sided with pressed wood. A similar maze air vent was placed on the outside wall of the darkroom over the loading bench, and a 12-inch fan was placed so as to draw air into the room.

The drawer-type film drying tray out of the unit was used as a wet film pass from the darkroom. A large film washing tank was made of sheet metal and placed outside the darkroom between the wet pass and the dryer. The gutted drying unit was placed in the darkroom as a loading bench and a cassette pass box with an "in-out" partition and a metal rod safety lock were constructed. A

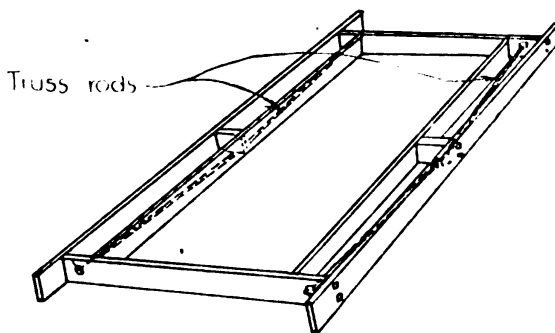
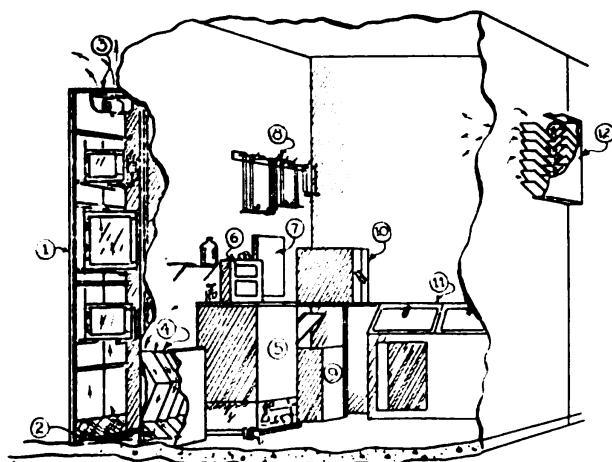


FIGURE 2b. Frame for table top with pressed wood cover removed. Designed to fit x-ray field table unit.

view box was recessed into the wall above the wash tank. The film processing assembly was then completed by placing a cutting and sorting bench along the wall adjacent to the dryer. Racks, similar to ones in the darkroom, were placed over this bench for hangers. A light-tight door was placed on the outside wall of the darkroom.

Fluoroscopic and radiographic rooms: The fly screen section of the outside wall in the fluoroscopic room was covered by a



- | | |
|--------------------------------------|-----------------------------------|
| ① Film dryer | ⑦ Back of recessed view box |
| ② Heating filament | ⑧ Film hangers |
| ③ Film dryer fan | ⑨ Wet film pass box with lid open |
| ④ Outlet ventilating maze into dryer | ⑩ Cassette pass box |
| ⑤ Processing tank unit | ⑪ Loading shelf & film bins |
| ⑥ Safe light | ⑫ Inlet ventilating maze & fan |

FIGURE 3. Section drawing of darkroom and dryer, showing ventilating system.

sliding, counterbalanced panel made of pressed wood. Light maze air vents were installed with the inlet on the outside wall and the outlet over the door. A squirrel-cage blower salvaged from a tank was powered with an electric motor and placed at the outside vent, blowing in. One of the field tables was set up for the horizontal roentgenoscope.

The Army field table is admirably suited for field use where portability and facility of setting up are primary considerations. For our purpose, in a more or less fixed installation, the table has certain limitations. No table top is provided. The unit is designed to receive a litter between the end uprights. We made rigid tops of pressed wood, using metal truss rods to bridge the part which would tend to sag (figure 2).

For vertical roentgenoscopy with the Army unit, a mechanism is provided by which the tube screen assembly is swung out and rotated to the vertical plane. Up and down motion is provided by a crank. When a large number of chest and gastric examinations are to be made, such an arrangement is very tedious.

A more suitable vertical fluoroscope was improvised by standing the Army table unit on end and fixing it to the floor with lag screws. The carriage was counterbalanced by using salvaged cable and pulleys from an airplane. The counterweights

were made of sheet metal and filled with sand. Because of outward thrust of the tube-screen assembly in the up-upright position, it was necessary to change one of the ball-bearing runner wheels from the front (top) to the back (bottom) of the track piping by bending a piece of strap steel into a "U" and bolting it to the assembly frame. An axle for the wheel was made of a bolt run through the "U" at

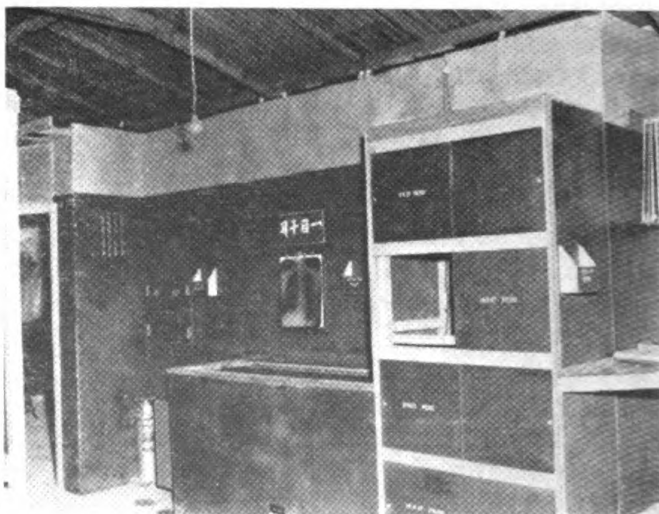


FIGURE 4. Photograph of the "light" processing system. The sign over the view box was made by a Chinese-American soldier. Suggested to us by Dr. Merrill C. Sosman, it says, "One eye is worth a thousand ears."

the proper distance. As a further precaution against forward thrust, the arm which carries a grooved wheel on the back (bottom) pipe was lengthened with a piece of strap iron and the wheel placed behind the pipe.

The roentgenographic rooms were completed by building table tops and setting up the urological table and the stereoscopic cassette changer. Lead-lined chests for film storage in the rooms were part of our equipment.

Accessories. Certain accessories were easily improvised. A mastoid board was constructed of plywood and sheet lead. Very good cones were made of shell casings. Another switch mechanism was incorporated in the foot switches, to put out the safe lights when the fluoroscopic tubes were energized. A good marker was made with a metal stamping machine.

Other rooms. A conference room 20 feet by 13 feet serves also as office, reading room, and library. Shelves made of packing boxes and covered with tar paper were put up for films, library books, and periodicals. View boxes were placed along the end wall, and desks and a conference table were provided (figure 6).

A waiting room, a receiving desk with file compartments, a linen closet, a utility closet, a room for a bunk and shower for the night men (a sink and gasoline sterilizer were placed in this room), and a room for a maintenance shop were constructed or provided (figure 1).

Utilities. A mountain stream behind our area has been dammed and clean water in inexhaustible quantity piped to the hospital. The temperature of this water averages 79° and has a variation of 1.7°. Electricity is supplied by four 30-kw. Diesel generators, run two at a time in synchronization. We have also our own 3-kw. auxiliary gasoline generator, which we have not had to use, but it has been tested and found excellent.

Specific problems. The most difficult problems in the tropics are the heat, high humidity, and dampness. The well-ventilated darkroom and fluoroscopic room are always comfortable. Dampness is counteracted by the liberal use of shellac on wiring and the frequent careful wiping of all electrical connections, following which they are covered with a coating of anhydrous petroleum. The machines are covered with a thin coating of oil or grease to prevent rusting and they are covered with tarpaulins when not in use.

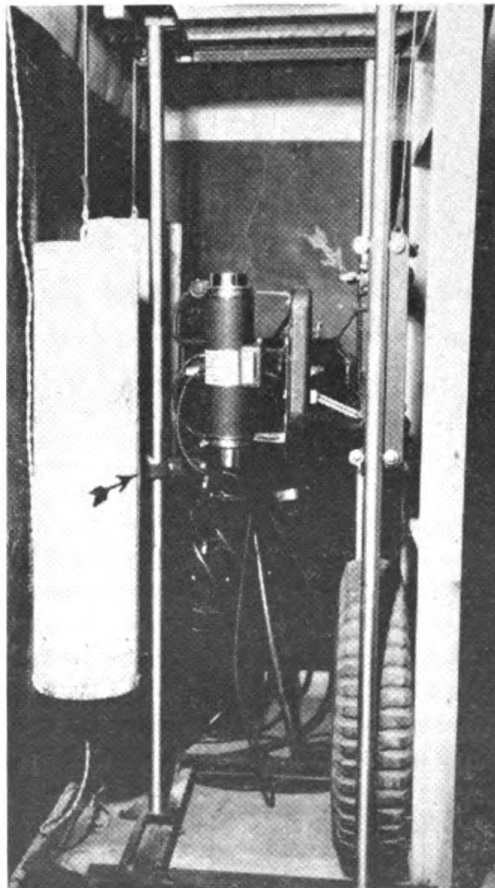


FIGURE 5. Vertical fluoroscope improvised from Army field table. The altered wheels are indicated by the arrows. The salvaged jeep tire acts as a bumper.

The refrigerator in the processing unit was out of service for a while and a replacement part was not immediately available. We therefore had experience with high-temperature (up to 81°) processing, which offered no particular difficulty so long

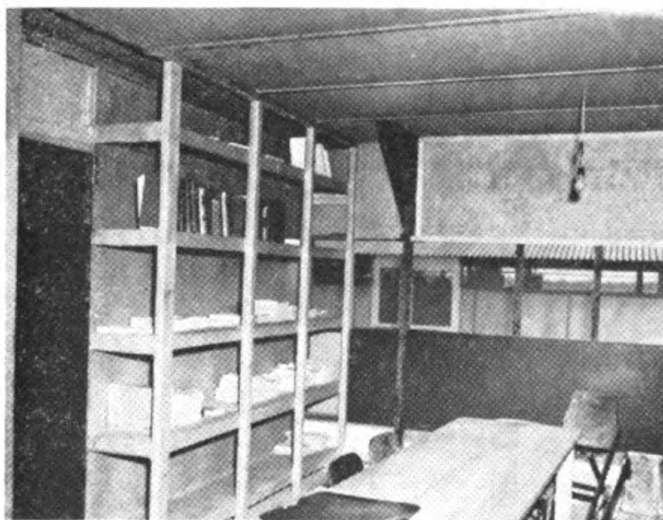


FIGURE 6. Photograph of library half of office room.

as the hypo solution was kept fresh. When this is changed about twice as often as for 65° processing, there is no tendency to emulsion blistering or separation. It was not found necessary to "hypo" for a longer time. The washing time is limited to ten minutes to prevent undue emulsion softening. There is a slight chemical fog, which does not, however, interfere seriously with the diagnostic quality of the films.

Malaria Control in Haiti.—Haiti has drained malaria swamps around six coastal communities with a combined population of 200,000 under the Inter-American health and sanitation program. These developments were reported by Ralph S. Howard, Jr., chief of the United States health mission to Haiti, on his arrival in Washington to confer with the Office of the Coordinator of Inter-American Affairs. Under the program Haiti and seventeen other American republics are cooperating with the assistance of the United States in raising hemisphere health standards, especially in areas of strategic production and defenses. Mr. Howard said malaria has been reduced to a secondary health problem in Port-au-Prince, Haiti's capital. This was accomplished largely through installation of fifteen miles of ditches and canals to eliminate mosquito-breeding swamps.

"The rest of the malaria control work involved installation of fifteen miles of drainage ditches and canals in and around Petit Goave, Aux Cayes, Cap Haitien, Port de Paix, and Mole St. Nicholas. These projects as well as four yaws clinics are largely in communities from which workers are drawn for rubber and fiber plantations."

Haiti has seventeen specialists making public health studies under the inter-American program. Seven of the men are studying at Harvard University and ten at the School of Tropical Medicine in San Juan, Puerto Rico. The mission headed by Mr. Howard, a sanitary engineer, is giving technical assistance to Haiti.

Colostomies

LIEUT. COLONEL CLIFFORD H. KEENE

Medical Corps, Army of the United States

Experience in the surgical care of about forty soldiers suffering from the sequelae of large bowel wounds is the basis for the following suggestions as to their management. All cases seen presented one or more fecal fistulas or colostomies. Early colostomy has been a life-saving measure in most of the cases. It is with high respect for the surgeons operating under field and battle conditions that we tender these suggestions.

A certain consistency prevailed in the types of colostomies performed. When an abdominal segment of the colon has been injured, a double-barreled colostomy or a variant thereof usually has been done at the site of injury. If diversion of the fecal stream away from a wound of the distal colon was desired, a double-barreled or simple loop colostomy was effected. The persistent use of a double-barreled or a loop colostomy, regardless of the purpose and regardless of its efficacy in accomplishing that purpose, is based on the anticipation that the reconstructive surgeon will want to crush the spur and then sew over the anterior wall. We have not closed any colostomy in that manner. Under such circumstances there is little indication for a double-barreled type of colostomy when another type of colostomy will more adequately perform the function for which it was intended. The formation of a double-barreled colostomy after the removal of an injured portion of the large bowel is a rational procedure. Even here, processes such as wound sepsis, scar-tissue contraction and retraction, and sloughing may militate against the ultimate use of a spur-crushing type of closure.

The formation of a double-barreled or loop colostomy to divert the fecal stream away from an injured distal segment is not rational since it does not wholly accomplish its purpose. This is true no matter how much attention is paid to the construction of a prominent spur. If the two stomata are in such proximity that the same dressing covers both of them, feces will progress from one to the other. It is the rule that a patient with a colostomy, while being evacuated to the United States, builds up a fecal impaction in the distal loop. This impaction can occur in a few days. The presence of feces in the distal loop has been a major factor in the persistence of fistulas from the lower colon and rectum to sites about the buttocks and pelvis. Six of our patients had two loops colostomies in different parts of the colon in the attempt to exclude feces from a large distal wound.

In such cases, we have accomplished the desired purpose by using the Devine Y-shaped colostomy or in the manner described below.

All of our cases of interruption of the continuity of the colon, regardless of the distortion of anatomy present, have been reconstructed in the same manner by a one-stage, intra-peritoneal, end-to-end anastomosis followed by a delayed closure of the wound. No spur crusher has been used. This has been done in twenty-seven instances with primary healing of the bowel in every case, often in spite of the presence of pus, contiguous osteomyelitis, and extensive scarring. All have had normal bowel function thereafter. In only one instance was any constriction demonstrated by x-ray and this was not productive of symptoms. There has been no mortality.

In view of the satisfactory results of this method of closure, we advocate that when a proximal colostomy is formed for a wound in the distal colon, that the colon be completely transected at the time, that the two ends be brought out on the abdominal wall at different sites, that the two ends be far enough apart (at least 6 cm. from edge to edge) to be covered by separate dressings, that no attention be paid to the formation of a spur. Our method of closure, previously described, does not require it. The colostomy procedure described is simple and quick and will accomplish absolutely the purpose of total exclusion of the injured distal bowel from the fecal stream. Because of these advantages, it could also be used in the instances, first discussed, where the abdominal colon has been injured and needs to be resected or exteriorized.

Devine, the Australian surgeon, has long recommended an exclusion colostomy with wide separation of the two stomata. However, the shape of his was predicated also on the expectation that a spur would have to be crushed to secure satisfactory continuity. He transects the colon, sews the two loops together along a longitudinal band, then brings the ends out through separate stab wounds on either side of the small primary incision. For closure, he uses a special long-armed spur crusher to necrotize the septum which is deep within the abdomen. Later the ends are inverted. The Devine colostomy works perfectly but is more difficult and time-consuming to construct. With the simple procedure which we advocate, it is not necessary.

A double-barreled colostomy with a properly constructed spur is easily closed in the time-honored manner. One might wonder why we have not done that. Over 60 percent of the cases we have seen are not candidates for the usual method because of retraction of bowel ends, loss of colonic substance, wound sepsis, extensive scarring, and the like. For some unaccountable reason, about 10 percent of the colostomies seen have been rotated through 180 degrees so that the defecating stoma is situated distal to the other stoma. This placed the mesentery between the loops. During the operative correction

of these cases, unsuspected interposition of small bowel, mesentery, and omentum was so frequently found that we deemed it advisable to investigate, by surgical dissection, all types of colonic openings regardless of the external appearance. This cautious attitude has paid dividends in that in three instances of apparently properly constructed Mikulicz colostomies we found knuckles of small bowel so placed that injury by a crushing clamp would have been unavoidable.

A summary of our procedure in re-establishing colonic continuity follows:

Preoperative preparation.

1. General measures—Patient should be gaining weight.
 - a. High protein (red meat) diet.
 - b. Whole blood, red blood cell suspension, and plasma transfusions.
 - c. Correction of fluid and electrolyte balance.
 - d. Vitamins.
2. Evaluation of bowel and sphincters by roentgenography and sigmoidoscopic examinations.
3. Anterior Bradford frame care if there is digestion or infection of the abdominal wall.
4. Daily irrigations of both loops with 1:4,000 potassium permanganate solution.
5. For one week prior to operation:
 - a. Low residue diet.
 - b. Succinylsulfathiazole, 0.5 gram per kilogram of body weight for twenty-four hours, then 0.25 gram per kilogram daily, given in equal doses every four hours.
6. For forty-eight hours preoperatively, sulfadiazine, or penicillin in selected cases.

Operative technique.

1. Meticulous irrigation of colostomy loops with soapy water followed by large amounts of sterile water.
2. Alcohol, ether, and merthiolate preparation of the area.
3. Complete freeing and mobilization of bowel ends.
4. Restoration of anatomical continuity by intraperitoneal end-to-end anastomosis. Two layers of sutures are used, a through-and-through continuous inverting suture of chromic catgut size 00 and a serosal layer of interrupted mattress-type No. 60 cotton.
5. Crystalline sulfanilamide, 5.0 grams, in the wound.
6. Peritoneum, transversalis fascia, and inner muscle closed with interrupted chromic size 1 catgut.
7. Silkworm-gut sutures placed through skin and outer fascia but not tied.
8. Wound packed open with one layer of petrolatum gauze plus dry gauze.

Postoperative care.

1. Wound inspected at forty-eight hours and if clean, silkworm-gut sutures are tied.
2. Nothing by mouth for forty-eight hours, then fluids and low residue foods with progressive liberality.
3. Intravenous fluids.
4. Penicillin or sodium sulfadiazine continued as and if indicated.

The Canoscope

An Improvised Projector

CAPTAIN HUGH J. HOPKINS

Medical Corps, Army of the United States

Medical meetings in New Guinea during the busy months since August 1943 were frequently handicapped by the lack of any means for the projection on a screen of pictures and records of interesting subjects. The passing of exhibits from hand to hand in the audience was not satisfactory.

The "Canoscope," a unique and strictly "G.I." creation, has proved very satisfactory, this far from civilization, for the projection on a screen of ordinary photographs or charts. A description of the various parts is both interesting and amusing. The "heart" of this projector is a large hand reading lens with silver handle, donated by an enlisted man who bought it in the United States with the intention of using it to start fires when stranded in the jungle or on some desert isle. All of the other parts used were either picked up or "borrowed" in this isolated Army post where electric sockets are much more valuable than they are at home.

The parts of the "Canoscope" are:

One large reading lens.	Two electric sockets.
One large dehydrated cabbage can.	One switch, plug, and wire.
One small peanut can.	Two 100-watt light bulbs.
One Cheddar cheese can.	Dark enamel paint.
Three plasma cans.	Heavy cardboard (supplied by the x-ray department).

As the projector is of the reflection type, it requires no glass lantern slides or other inconvenient preparations for its use. Pictures, charts, illustrations in books, and specimens may all be readily shown without special preparation, which is an important feature in isolated areas. In projection, the image on the screen is reversed, which is unimportant except for the fact that print reads in reverse. This is easily remedied by the use of carbon paper placed in reverse in a typewriter. Thus the print is typed in reverse on the back of the paper and when projected on the screen reads correctly. With the projector at a distance of about 10 feet, an image of 4 to 6 feet is thrown on the screen. Illumination is very satisfactory, considering the fact that reflected light is used instead of transmitted light, as in the usual type of commercial lantern slide projector in use in the homeland.

A front view of the projector is shown in figure 1. The large cabbage can is the main body of the machine, with the plasma can lens-unit projecting from the front. The three plasma cans form this unit. A 3-inch section of one plasma can has been split and made slightly larger. This section is passed halfway into the large can through an opening in the front and firmly soldered in

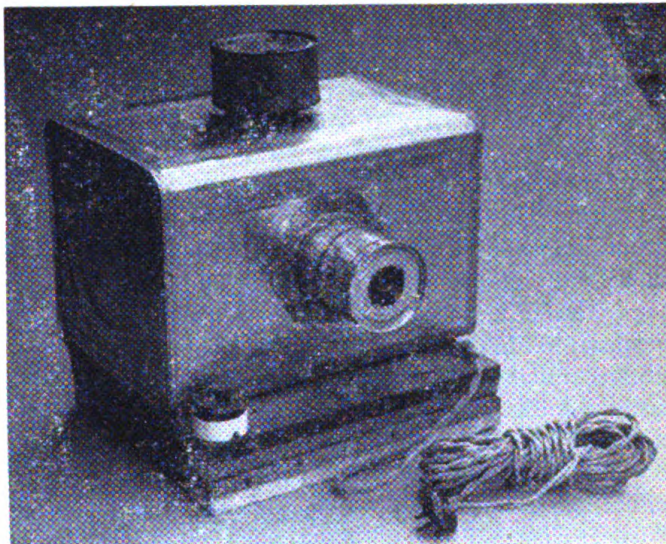


FIGURE 1. Showing the large cabbage can with the plasma can lens-unit projecting from the front surface. The Cheddar cheese can is seen on the upper surface supported by the peanut can and forming the ventilator.

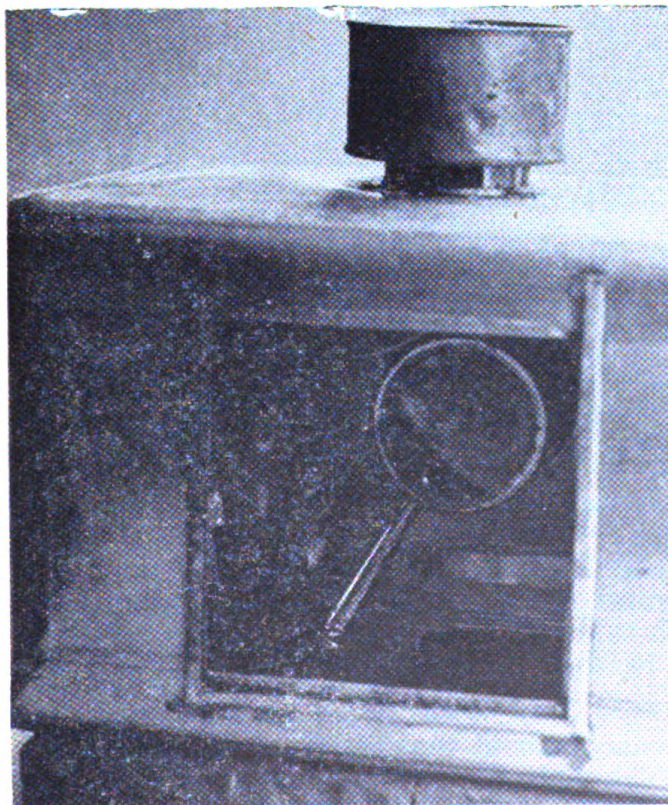


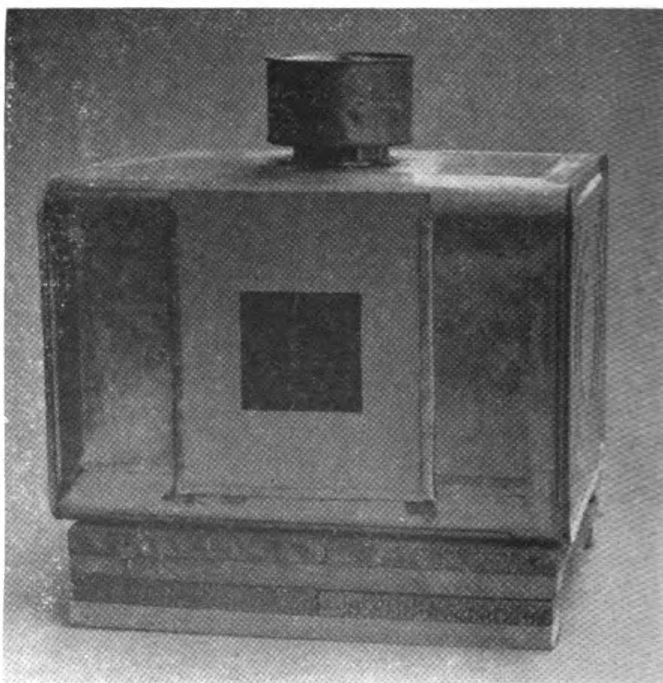
FIGURE 2. The mounting of the large hand reading lens in the back end of the second plasma can. One electric socket is shown to the left. The three grooved sides of the large square opening are shown. On the top is the ventilator.

place with its axis perpendicular to the front surface. Snugly sliding through this section is the lens-unit proper, which is made of the remaining two plasma cans. A large opening with a $\frac{1}{8}$ -inch border was made in the bottom of one plasma can. Directly behind this border the lens was mounted as shown in figure 2. Because of its short focal distance, it was found necessary to mount it near the object to be projected. The front end of this unit was made from a 2-inch section of the bottom end of the third plasma can. A

1 1/8-inch circular opening was made in the bottom of this can and the short sides of this section were split in four places in order that it might be compressed and forced into the front end of the lens section as seen in figure 1. The circular opening functions as a diaphragm and aids in producing a clear image. The entire inner surface on this lens unit was covered with dark enamel to eliminate reflection of light which would interfere with the image.

On the upper surface of the cabbage can is the ventilator which is formed from the two smaller cans. Large openings, concealed by the larger of the two cans, allow the escape of heat but not of light. In the bottom of the cabbage can, opposite the ventilator, is a corresponding opening which communicates with the space between the two baseboards and thus completes the

circulation of air and aids in the elimination of heat. An electric socket is mounted in each front corner of the large can, one of which possibly may be seen in figure 2. Into the grooves of the three sides of the large square opening in the back (figure 2) is passed a piece of heavy cardboard. In this, directly opposite the lens, is cut an opening the size of the picture to be shown, as illustrated in figure



3. Several such squares of cardboard may be made with openings of various sizes and shapes so that pictures of different sizes may be shown on the screen. Other details of construction may be readily obtained from the illustrations.

OPERATION

The projector is placed about ten feet from the screen in a well-darkened room. The picture, chart, or book to be projected is placed over the opening in the cardboard in the inverted position and the current is switched on. The focusing of the image may be easily obtained by sliding the lens-unit in or out as needed. To prevent light from striking the audience between pictures, the projector should be switched off before the change is made.

Clinical Notes

EOSINOPHILIA IN CEREBROSPINAL FLUID

Report of Case

CAPTAIN DAVID SELMAN

Medical Corps, Army of the United States

A white male, aged 31, was admitted to this hospital on 21 May 1944, complaining of headache and vomiting of eight hours' duration. The previous history revealed vague headaches and backaches for many years. In 1934 he complained of nausea at breakfast time practically every day for one year. He sustained a head injury in 1939 and was dazed but did not lose consciousness. In February 1943 he was hospitalized for seven days because of a reaction following typhoid fever vaccination. For slightly more than a year prior to the present admission he had occasional nausea and, at infrequent times, vomiting. Symptoms referable to the lower bowel had never been present. The patient was a heavy drinker prior to induction into the Army in December 1942. On 6 May 1944 he was hospitalized during an outbreak of food poisoning and was discharged as cured on 15 May 1944; stool examinations at that time were negative for ova and parasites. On discharge from the hospital he received the last of three prophylactic injections of typhus fever vaccine. The next morning he had frontal headache for three hours and then became asymptomatic. At 3 a. m. on 21 May 1944 he awoke with a throbbing frontal and bilateral temporal headache accompanied by nausea and three hours later by vomiting, necessitating hospitalization.

On admission he did not appear acutely ill. The temperature was 100.4° F. The only abnormal physical findings were tenderness on the left side of the bridge of the nose and a diffusely injected throat. On the following day the symptoms were unchanged, but in addition a moderate degree of nuchal rigidity was noted. The neurologic examination was normal. Lumbar puncture revealed a hazy and colorless cerebrospinal fluid at a pressure of 12 mm. of mercury, with 480 cells per cubic millimeter with 71 percent eosinophils and 27 percent lymphocytes; the sugar was normal and the total protein was 62 mg. per 10 cc.; the Wassermann reaction and the colloidal gold test were negative. The blood contained 7,400 leukocytes per cubic millimeter, of which 5 percent were eosinophils. Subcutaneous nodules were not present. On the third day the nuchal rigidity disappeared. The cerebrospinal fluid cell count now reached its maximum of 670 per cubic millimeter with 78 percent eosinophils (figure 1). On the fifth day, repeat neurologic examination revealed diminution of the right Achilles reflex; subsequent examinations (sixth to fifteenth days) also showed transient changes in the left ankle jerk. The cerebrospinal fluid on the twenty-first day of the illness contained only 5 cells per cubic millimeter including one eosinophil. Interval white blood counts varied between 6,050 and 11,000 per cubic millimeter with a normal differential; the eosinophils never exceeded 5 percent. Other laboratory studies included repeated stool examinations for ova and worms and x-ray examinations of the soft tissues of the neck; these were reported normal.

The convalescence was uneventful; the headache subsided after one week, the patient became ambulant on the eleventh day of his illness, and he was sent to duty after thirty days of hospitalization.

Major Joseph G. Cutler cooperated in the preparation of this paper.

Comment

Eosinophilia in the cerebrospinal fluid is said to be virtually pathognomonic of parasitic involvement of the central nervous system.¹ Since Waterhouse² first noted the association of eosinophilia of the cerebrospinal fluid with cerebral cysticercosis, several similar cases have been reported.³ Although a large number of eosinophils were present in the cerebrospinal fluid, in some cases the blood contained a normal number of such cells. This is in accord with the case presented above. Applebaum and Wexberg, in a review of literature, observed that conditions other than cysticercosis may be responsible for cerebrospinal eosinophilia, namely, (1) neurosyphilis, (2) experimental serum meningitis, (3) therapeutic intraspinal malarial blood injections, and (4) cerebral echinococcal infection.

In the case under discussion, the history and the clinical and laboratory findings were sufficient to rule out the above-mentioned causes except cysticercosis and *Echinococcus*. Unfortunately intradermal, complement-fixation, or precipitin tests for *Cysticercus cellulosae* and *Echinococcus* were not done, because the material was unavailable. Echinococcal infection was never

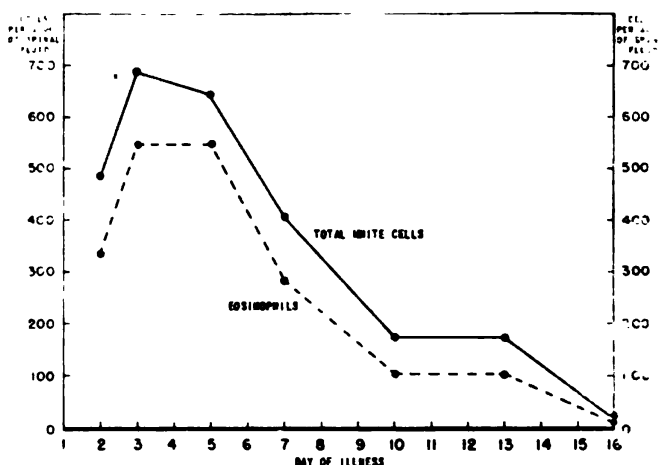


FIGURE 1. Relation of eosinophils to total number of white blood cells in spinal fluid.

seriously considered because when this condition involves the central nervous system the picture is not, as a rule, as acute as that in this case. We were, therefore, left with cysticercosis as the most probable diagnosis despite the absence of more specific clinical and laboratory evidence.

The striking feature in this case was the sudden onset only six days following the administration of typhus fever vaccine; this would lead one to suspect a relation between the two. It would have been of interest to know whether a cerebrospinal eosinophilia existed when the patient complained of severe headache the day following vaccination. Is it possible that the administration of typhus fever vaccine can produce an eosinophilia of the spinal fluid in certain patients? This question can only be answered by examining the cerebrospinal fluid in all patients who present symptoms similar to those described in this case.

Summary

1. In a case of acute meningitis characterized by a pronounced eosinophilia of the cerebrospinal fluid, despite the absence of clinical and laboratory confirmation, cerebrospinal cysticercosis is considered the most likely diagnosis.

2. The possibility of a relation between recent typhus fever vaccination and eosinophilia in the spinal fluid is suggested.

1. Wechsler, I. S.: A Textbook of Clinical Neurology, 5th ed., p. 83. Philadelphia: W. B. Saunders Company, 1943.

2. Bath Clinical Society, Lancet, Lond., 1:884-885, 1 April 1911.

3. Applebaum, I. L., and Wexberg, L. E.: Eosinophilia in Cerebrospinal Fluid, J. A. M. A., 124:830-831, 25 March 1944.